Third Five-Year Review Report

For

McCormick & Baxter Creosoting Company Superfund Site

September 26, 2011

Prepared by:

Oregon Department of Environmental Quality

and

U.S. Environmental Protection Agency

Third Five-Year Review Report

McCormick & Baxter Creosoting Company Superfund Site

Portland, Oregon

Nina DeConcini

9/30/11

Nina DeConcini, Administrator

Date

Northwest Region

Oregon Department of Environmental Quality

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Third Five-Year Review Report

McCormick & Baxter Creosoting Company Superfund Site

Portland, Oregon

Daniel D. Opalski, Director

9/26/2011

Date

Office of Environmental Cleanup

U.S. Environmental Protection Agency

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FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: McCormick & Baxter Creosoting Company		
EPA ID *(from WasteLAN)*: ORD009020603		
Region: 10	**State: OR**	**City/County: Portland / Multnomah**
SITE STATUS		
NPL status: X Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐Under Construction ☐Operating **X** Complete		
Multiple OUs*? X YES ☐ NO	**Construction completion date:** 09 / 27 / 2005	
Has site been put into reuse? ☐ YES **X** NO		
REVIEW STATUS		
Lead agency: ☐ EPA **X** State ☐ Tribe ☐ Other Federal Agency ______________________		
Author names: Scott Manzano / Nancy Harney		
Author title: Project Managers	**Author affiliation: ODEQ / USEPA**	
Review period**: 09 /26/ 2006 to 09/ 26 /2011		
Date(s) of site inspection: 08 /05 / 2011		
Type of review: **X** Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site **X** NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) ☐ 2 (second) **X** 3 (third) ☐ Other (specify) __________		
Triggering action: ☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____ ☐ Construction Completion **X** Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date *(from WasteLAN)*: 09/26/2006		
Due date *(five years after triggering action date)*: 09 /26 /2011		

* [“OU” refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form (continued)

Issues:

1. Alternate Concentration Limits (ACLs): The EPA determined that ACLs are not valid as substitutes for MCLs in groundwater at this Site (this issue was identified in the previous Five-Year Review). Need to formally replace the ACLs with revised cleanup goals and identify the associated points of compliance for the groundwater remedy.
2. Institutional Controls: ICs have not been implemented as required in the Record of Decision (ROD) for the Site groundwater and soil cap remedies.

Recommendations and Follow-up Actions:

1. Prepare a ROD Amendment to replace ACLs with revised cleanup goals and identify associated points of compliance.

2. Establish and implement an IC Implementation and Assurance Plan.

Protectiveness Statement(s):

The Site has achieved construction completion and therefore, in accordance with the Five-Year Review Guidance, this section includes a site-wide protectiveness statement in addition to protectiveness statement for each operable unit (OU) where a remedial action has been initiated and completed.

Soil Operable Unit: The remedy for the soil OU is currently protective of human health and the environment in the short-term because the upland soil cap and engineering controls required by the ROD have been implemented, and are working as intended. However, in order for the remedy to be protective in the long-term, DEQ and EPA need to implement the institutional controls (ICs) required by the ROD for the soil cap remedy.

Sediment Operable Unit: The remedy for the sediment OU is protective of human health and the environment because the remedy required by the ROD has been implemented, and is working as intended.

Groundwater Operable Unit: The remedy for the groundwater OU is currently protective of human health and the environment because the soil, sediment, and groundwater remedies have been implemented and the remedial action objectives (RAOs) in the ROD have been met. However, the ROD cleanup goals (i.e., ACLs) have been invalidated and ICs have not been implemented, so in order to ensure the remedy remains protective in the long term and all ARARs are achieved, a ROD Amendment that establishes new cleanup goals needs to be completed and the ICs required by the ROD for the groundwater remedy need to be implemented.

Site-wide Protectiveness: The remedies at these OUs are designed to work as an integrated system to meet the RAOs and cleanup goals established for the Site. The remedies for soil, sediment, and groundwater currently are protective of human health and the environment, because the soil and sediment caps, barrier wall, sediment ICs, and engineering controls required by the ROD have been implemented. However, in order for the remedies to be protective of human health and the environment in the long-term, a ROD Amendment that establishes new cleanup goals and points of compliance needs to be completed for the groundwater remedy and the ICs by the ROD for the soil and groundwater remedies need to be implemented.

Other Comments:

EPA and DEQ are evaluating placement of gravel over the articulated concrete block (ACB) cap to reduce physical hazards due to the ACB void spaces.

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TABLES

FIGURES

ATTACHMENTS

ACRONYMS

ACB	articulated concrete block
ACL	alternate concentration limit
ACZA	ammoniacal copper zinc arsenate
ARAR	applicable or relevant and appropriate requirement
AWQC	ambient water quality criteria
bgs	below ground surface
BNSF	BNSF Railway Co.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
COC	constituents of concern
CPA	central processing area
cPAH	carcinogenic PAH
DEQ	Oregon Department of Environmental Quality
DHS	Oregon Department of Human Services
DNAPL	dense non-aqueous phase liquid
E&E	Ecology & Environment, Inc.
EES	Easement and Equitable Servitude
EPA	U. S. Environmental Protection Agency
EQC	Environmental Quality Commission
ESD	Explanation of Significant Difference
FWDA	former waste disposal area
GSI	GSI Water Solutions, Inc.
HDPE	high density polyethylene
HEM	hexane extractable matter
HI	Hazard Index
HPAH	high molecular weight PAH
IC	institutional control
LNAPL	light non-aqueous phase liquid
LPAH	low molecular weight PAH

LWG	Lower Willamette Group
M&B	McCormick & Baxter Creosoting Company
MCL	maximum contaminant level
MDL	method detection limit
MSU	Montana State University
µg/kg	microgram per kilogram
µg/L	microgram per liter
mg/kg	milligram per kilogram
mg/L	milligram per liter
ng/L	nanogram per liter
NAPL	non-aqueous phase liquid
NAVD	North American Vertical Datum
NCP	National Oil and Hazardous Substances Contingency Plan
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDWR	National Primary Drinking Water Regulation
NPL	National Priorities List
NRWQC	National Recommended Water Quality Criteria
O&F	operational and functional
O&M	operation and maintenance
OHW	ordinary high water
ORS	Oregon Revised Statute
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PCP	pentachlorophenol
PCR	polymerase chain reaction
PDMS	polydimethylsiloxane
PPA	Prospective Purchaser Agreement
PSU	Portland State University
RAO	remedial action objective
RCM	reactive core mat
RCRA	Resource Conservation and Recovery Act
RNA	Regulated Navigational Area

ROD	Record of Decision
RPM	Remedial Project Manager
SAP	sampling and analysis plan
Site	McCormick & Baxter Creosoting Company Superfund Site
SPME	solid phase micro-extraction
SSC	Superfund State Contract
SWQC	Surface Water Quality Criteria
TEF	toxic equivalency factor
TFA	tank farm area
TPAH	total PAH
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCG	U.S. Coast Guard
UT	University of Texas

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I. INTRODUCTION

The Oregon Department of Environmental Quality (DEQ) and the United States Environmental Protection Agency (EPA) have conducted this Five-Year Review of the remedial actions implemented at the McCormick & Baxter Creosoting Company Superfund Site (Site), located in Portland, Multnomah County, Oregon. This review was supported by DEQ's Contractors, Hart Crowser, Inc., and GSI Water Solutions, Inc. (GSI).

The purpose of a Five-Year Review is to determine whether the selected remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review Reports. The Five-Year Review identifies issues, recommendations, and follow-up actions.

This review is required by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. § 9601 et seq., and the National Oil and Hazardous Substances Contingency Plan (NCP), 40 C.F.R. § 300.430(f)(4)(ii). CERCLA Section 121(c), 42 U.S.C. § 9621(c), states:

If the President selects a remedial action that results in hazardous substances, pollutants, or contaminants remaining at the Site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP at 40 C.F.R. §300.430(f)(4)(ii)states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

Five-Year Reviews are required at this Site because hazardous substances, pollutants, or contaminants remain above levels that allow for unlimited use and unrestricted exposure. This is the third Five-Year Review Report for the Site. The Second Five-Year Review Report was issued on September 26, 2006. This Five-Year Review focuses on the Site work and activities that have taken place since the completion of the Second Five-Year Review.

II. SITE CHRONOLOGY

A chronology of major Site events is provided in Table I-1.

III. BACKGROUND

Site Description

The Site includes a former wood-treating facility located on the east bank of the Willamette River at 6900 Edgewater, in Portland, Oregon ("the McCormick & Baxter Property" which consists of the area owned by the McCormick & Baxter Creosoting Company). The Site encompasses approximately 41 acres of land and an additional 23 acres of contaminated river sediments. Figure III-1 is the Site location map. Figure III-2 shows the current Site layout and features from an aerial photograph. Figure III-3 depicts the current Site layout and features on a topographic map of the sediment and terrestrial surface elevations.

The upland portion of the Site is on a terrace of imported sand fill (dredged material placed in the early 1900s) within the historic flood plain of the Willamette River. This upland area is generally flat and lies between a 120-foot-high bluff along the northeast border and a 25- to 30-foot-high bank along the Willamette River to the southwest. Currently, the McCormick & Baxter Property is vacant except for a paved parking area, small shop building, two field office trailers, and associated utilities.

Inactive industrial properties border the Site to the southeast, and a residential area is located above the Site on the adjacent bluff. A BNSF Railway Co. (BNSF) track crosses the northwest portion of the Site, and Union Pacific Railroad tracks border the Site to the southeast below the bluff. The perimeter of the McCormick & Baxter Property is fenced and posted with warning signs.

Three hydrostratigraphic units are present at the Site: the shallow, intermediate, and deep aquifer zones, which are interconnected to varying degrees depending upon the location within the Site. The shallow zone consists of poorly graded dredge-fill sand and wood debris; it ranges in thickness from 5 to more than 30 feet. In parts of the Site, the shallow zone consists mostly of sawdust and wood chips up to 20 to 25 feet thick. The shallow zone acts as an unconfined aquifer that is in hydraulic connection with the river. This connection, however, significantly diminishes toward the bluff and within the barrier wall area. Depth to groundwater ranges from approximately 20 to 25 feet below ground surface (bgs). In much of the Site, the shallow zone is underlain by a silt aquitard, ranging in thickness from zero near the river to more than 100 feet closer to the bluff.

The intermediate aquifer zone is composed of fine- to medium-grained alluvial sand and is present below the silt aquitard over most portions of the Site. This zone varies in thickness from zero to more than 50 feet. In the north-central portion of the Site, the intermediate zone is approximately 12 feet thick and hydraulically separated from the shallow aquifer. In the south-central portion of the Site, the silt aquitard is more than 100 feet thick, and no intermediate aquifer zone is present. Along the beach adjacent to the river, the intermediate zone is up to 50 feet or more thick and is separated from the shallow zone by a discontinuous, thin silt layer.

The deep aquifer zone is present in all portions of the Site. The deep zone consists of alluvial sands and is directly connected with the intermediate and shallow zones along the river margin. Near the center of the Site, the deep zone is separated from the shallow zone by more than 100 feet of low-permeability silt. Near the bluff, the deep zone is composed of gravel and sands of the Troutdale Formation and Catastrophic Flood Deposits.

Shallow groundwater gradients generally exist from the bluff toward the river. Intermediate and deep zone groundwater surface elevations and gradients have been inferred to flow toward the river in these zones.

The Willamette River is the only surface water body at the Site. Near the Site, the river is approximately 1,550 feet wide, with a typical maximum depth of about 45 to 55 feet below the National American Vertical Datum (NAVD). Average flow rates in the river near the Site range from 8,300 cubic feet per second (cfs) in summer to 73,000 cfs in winter (based on the discharge rates measured at the Morrison Bridge – U.S. Geological Survey (USGS) Site ID 14211720).

Site History

Much of the Site was created from dredged materials in the early 1900s. At that time, a sawmill operated in the southeast portion of the property. McCormick & Baxter Creosoting Company was founded in 1944 to produce treated wood products, including lumber, piling, timbers, and railroad ties during World War II. The wood-treating operations continued until October 1991.

Four retorts were located in the central processing area (CPA) at the Site and were used for various pressure treating processes, which included the use of creosote, pentachlorophenol (PCP), chromium, ammoniacal copper arsenate, ammoniacal copper zinc arsenate (ACZA), and Cellon (PCP in diesel oil, liquid butane, and isopropyl ether). Also present at the Site were a 750,000-gallon creosote product storage tank and a tank farm area (TFA) with several additional tanks for storing wood-treatment chemicals.

From 1950 to 1965, waste oil containing creosote and/or PCP was applied to the Site soil for dust suppression in the CPA. Liquid process wastes reportedly were discharged to a low area near the TFA before 1971.

Between 1945 and 1969, the plant's wastewater from the retorts' oil/water separators, along with the boiler blowdown and condenser cooling water were directly discharged to the Willamette River. Three stormwater outfalls were also present along the river. Two of the outfalls were permitted under the National Pollutant Discharge Elimination System. Following plant shutdown, DEQ placed earthen berms around stormwater collection sumps at the Site as an early response action to minimize off-site discharge. The stormwater outfalls were removed as part of the first phase of the soil remedial action in 1999.

Two major spills reportedly occurred at the Site: a 50,000-gallon creosote release in the TFA in approximately 1950; and a large spill of an unspecified volume of creosote from a tank car near the TFA in 1956.

Sludge from on-site processes was disposed of at an unknown off-site location until 1968. From 1968 to at least 1973, residues from the retorts, oil/water separators, and evaporators were disposed of on-site in the former waste disposal area (FWDA) in the western portion of the Site. Beginning in 1972, wood preservative sludge was placed in metal containers that were stored on Site in the FWDA. After 1978, wood preservative sludge was shipped to Chem-Security System, Inc., a permitted hazardous waste disposal facility near Arlington, Oregon. In 1981, the hazardous waste storage area was secured with a fence and lock, and a manifest system was implemented to comply with hazardous waste regulations.

Concrete walls and slabs were built around the ACZA process and storage facilities in 1980 to prevent spills from entering the soil. The retorts and retort openings were lined with concrete, but the integrity of the concrete was not verified. The creosote lines and other pipelines passed through a concrete underground walkway that extended from the TFA to the retort building. In 1985, 2 feet of soil and sludge were excavated from the TFA and were shipped to a hazardous waste landfill. Visibly contaminated soil remained at the TFA.

Site investigations have revealed many releases of wood-treating chemical compounds to soils, groundwater, and sediments as a result of these operations. Contaminants detected include polynuclear aromatic hydrocarbons (PAHs, comprising 85 percent of the creosote), PCP, arsenic, chromium, copper, zinc, and dioxins/furans. Three main contaminant sources existed at the Site: the FWDA, which was located in the western corner of the Site adjacent to the Willamette River and was characterized by a large depression where waste oils, retort sludges, and wastewater were disposed of over a period of several years; the CPA, which was located in the center portion of the Site and was where retorts, PCP mixing shed, and ACZA storage areas formerly were located; and the TFA, which was located in the south-central portion of the Site and was the former location of the main tank farm, creosote storage tank, and several other wood treatment process-related tanks or process areas. Releases from these source areas (particularly in the TFA and FWDA) in the form of insoluble wood-treating contaminants or non-aqueous phase liquids (NAPL) have significantly impacted subsurface soils, groundwater, and sediment. Remedial investigations identified two large NAPL plumes migrating to the river and impacting surface water and sediments. Subsequent monitoring identified another NAPL plume migrating under the BNSF right-of-way toward Willamette Cove. An additional investigation was conducted in the northern corner of the Site to determine the nature and extent of NAPL associated with monitoring well MW-1s. This investigation found only trace amounts of NAPL apparently composed of weathered crude or bunker oil.

Regulatory History

The McCormick & Baxter Creosoting Company began environmental investigations of its property in 1983. Based on those investigations, DEQ entered into a Stipulated Order with McCormick & Baxter Creosoting Company in 1987 requiring the implementation of corrective actions. Corrective actions included the installation and operation of a groundwater extraction and treatment system, construction of drip pads in retort areas, construction of covered storage areas for treated wood, and collection and treatment of stormwater. In December 1988, the McCormick & Baxter Creosoting Company filed for Chapter 11 bankruptcy; and, in 1990 DEQ assumed responsibility for completing the investigations and cleanup activities at the Site. In October 1991, the McCormick & Baxter Creosoting Company ceased operations.

DEQ began the Remedial Investigation and Feasibility Study in 1990 and issued a public notice of a proposed cleanup plan in January 1993. DEQ elected not to finalize the proposed remedial actions at the Site due to the proposed addition of the Site to the National Priorities List (NPL) by EPA in June 1993. The Site was added to the NPL on June 1, 1994. DEQ completed a revised Feasibility Study in 1995.

DEQ and EPA entered into a Superfund State Contract (SSC) in May 1996. The SSC documents the responsibilities of DEQ as the lead agency and EPA as the support agency during the remedial action. Among other items, the SSC specifies cost sharing between DEQ and EPA. The SSC was most recently amended in February 2005.

Construction Completion

In September 2005, the McCormick & Baxter Superfund Site achieved the construction completion milestone. This designation means that all remedial action required by the Record of Decision (ROD), the ROD Amendment, and the Explanation of Significant Difference (ESD) were implemented, completed, and documented in a Preliminary Close-Out Report. Since that time, only the soil OU has been determined to be operational and functional (O&F). The O&F determinations have not been made for the sediment and groundwater OUs.

Additional regulatory background information on the McCormick & Baxter Superfund Site can be found in the following documents:

- *Record of Decision*, McCormick & Baxter Creosoting Company Portland Plant, Portland, Oregon, EPA and DEQ, March 1996.
- *Amended Record of Decision*, McCormick & Baxter Creosoting Company Portland Plant, Portland, Oregon, EPA and DEQ, March 1998.
- *First Five-Year Review Report*, McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon, September 2001.
- *Second Five-Year Review Report*, McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon, September 2006.
- *Explanation of Significant Difference (OU3 – Final Groundwater)*, McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon, EPA and DEQ, August 2002.
- *Preliminary Close-Out Report*, McCormick & Baxter Creosoting Company Superfund Site, Portland, Multnomah County, Oregon, EPA, September 2005.

Removal Actions

Removal actions were completed by DEQ under State of Oregon cleanup regulations prior to listing on the NPL and under CERCLA authority between Site listing and issuance of the ROD. A list of these removal actions is provided in the document titled Preliminary Close-Out Report (EPA, September 2005). These actions included:

- Installation or a fence around the McCormick & Baxter Creosoting Company Property to control access.
- Placement of warning buoys along the river and posting or warning signs on the fence.
- Mitigation of potential off-site migration of contaminated airborne particulates through dust control measures, such as grass seeding and limitation of site traffic.
- Stormwater containment through diversion and collection or stormwater in retort sumps.
- Maintenance, sale, and transfer of remaining wood-treating chemicals.
- Demolition and off-site disposal of several site structures and materials, including the sale and removal of salvageable equipment and materials from the site.
- Removal of asbestos material from retorts and buildings and recycling or disposal of chemicals stored in the laboratory.
- Disposal of 151 drums of wood-treating process waste.

- Treatment of approximately 400,000 gallons of stormwater collected from retort sumps and discharge to the Willamette River.
- Collection and analysis of approximately 650 soil samples to identify the most highly contaminated areas for initial removal actions.
- Excavation and off-site disposal of approximately 377 tons of contaminated soil from three "hot spot" areas.
- Installation of an interceptor trench downgradient of the TFA to recover light NAPL (LNAPL).
- Dismantling of chemical storage tanks, retorts, and several buildings, and off-site disposal of sludges.
- Installation and monitoring of 21 new wells to further delineate the extent of NAPL contamination.
- Recovery of NAPL from monitoring and extraction wells. Starting in 1989, creosote was purged every week from five monitoring wells at the Site. Approximately 450 gallons were recovered between July 1989 and November 1991. By February 1995, more extraction wells had been added to the system and approximately 1,800 additional gallons of creosote had been removed.
- Installation of a fully automated pilot-scale wastewater treatment system to separate NAPL and treat groundwater removed through total fluid extraction efforts in the TFA. Wells in the FWDA were used for pure-phase NAPL extraction and were not connected to this treatment system. The treatment system in the FWDA consisted of an oil/water separator, an in-line anthracite/clay filter, two granulated activated carbon units, and a metals treatment unit.
- Modification in 1994 of the fully automated TFA system to a 40-hour per week system. The fully automated system required constant monitoring and temporary shutdown of the extraction system to minimize recovery of groundwater. Field data collected between 1992 and 1994 indicated that weekly pumping yielded as much NAPL as the fully automated system.

REDEVELOPMENT POTENTIAL

As discussed in the Second Five-Year Review, a Site Reuse Assessment was conducted between February 2000 and June 2001 by the City of Portland, Bureau of Planning, under a grant from EPA. In developing reuse recommendations, the City analyzed the Site's redevelopment potential and engaged stakeholders and the interested public in learning about, proposing, and jointly considering what uses would best fit the Site. The City's findings were presented in a final report dated June 2001 and endorsed by the Portland City Council on July 25, 2001. The City concluded that the Site is best suited for recreational use.

IV. REMEDIAL ACTIONS

REMEDY SELECTION AND MODIFICATIONS

In March 1996, EPA and DEQ issued one ROD for the Site to address several different media: contaminated soil, groundwater, stormwater, and Willamette River sediment. The selected remedy required the following media-specific actions to mitigate the principal threats at the Site:

- Excavation, consolidation, and biological treatment/stabilization of the most highly contaminated soils

- Soil capping
- Enhancement of the existing groundwater and NAPL extraction and treatment system
- As a contingent remedy, installation of a vertical subsurface barrier wall in the event that mobile NAPL cannot be reliably controlled
- Sediment capping
- Monitoring
- Institutional controls (ICs)

In March 1998, a ROD Amendment was issued by EPA and DEQ to change a component of the selected remedial action for contaminated soil. The soil remedy in the ROD called for excavation and on-site biological treatment. After the ROD was signed, DEQ initiated additional soil sampling for remedial design. This sampling found dioxin contamination was more widespread than previous analyses indicated. Accordingly, DEQ and EPA reevaluated the remedy and subsequently, in the ROD Amendment, selected an alternative that called for removal and off-site disposal of shallow soil with concentrations above designated action levels and capping the remaining contaminated soil.

In August 2002, EPA and DEQ issued an ESD explaining the decision to implement the contingent remedy for groundwater as specified in the 1996 ROD. The groundwater remedy selected in the ROD included a contingency that involved installing an impermeable subsurface barrier wall in the event that either: (1) NAPL could not be reliably contained using hydraulic methods; or (2) the barrier wall improves the overall cost-effectiveness of the groundwater remedy. DEQ and EPA determined that NAPL had not been contained using groundwater/NAPL extraction and recovery measures, and concluded that hydraulic control of NAPL or groundwater had not been established in either the TFA or the FWDA. In 2003, a fully encompassing, impermeable subsurface barrier wall was constructed in accordance with the ESD.

Remedy Description and Implementation

The Site was divided into three OUs to facilitate and manage remedy costs, implementation, and construction. The overall remedy is designed to function as an integrated containment system. The entire Site is capped; the combined upland capping extends to the riparian area along the shoreline where it meets the sediment cap. The capping works in conjunction with the barrier wall, as a complementary system, to meet the Site Remedial Action Objectives (RAOs) and prevent contaminated groundwater from adversely impacting the Willamette River.

Soil Remedy

The soil remedy is composed of three primary components: removal of highly contaminated soil within 4 feet of the ground surface, capping, and ICs[1]. The RAOs for the soil remedy are:

- Prevent human exposure through direct contact (ingestion, inhalation, or dermal contact) to contaminated surface and near-surface soil that would result in an excess lifetime cancer risk above $1x10^{-6}$ for individual compounds, above $1x10^{-5}$ for additive carcinogenic compounds, or

1 To improve readability in this Five-Year Review, the ICs for the soil, sediment, and groundwater remedies have been consolidated and will be described later in this section.

above a Hazard Index (HI) of 1 for noncarcinogenic compounds in an industrial land use scenario.

- Prevent stormwater runoff that contains contaminated soil from reaching the Willamette River.

Soil Removal

The purpose of the soil remedy was to eliminate the potential for future human contact with soil less than 4 feet in depth that has contaminant concentrations above removal action levels. Removal action levels for contaminated soils were defined for excavation and off-site disposal for arsenic, PCP, and total carcinogenic PAHs. These action levels indirectly address the removal of dioxins/furans because of their presence predominantly in areas where elevated concentrations of PCP or PAHs were found in soil.

Soil excavation activities were performed from February through May 1999, and effectively eliminated the presence of the contaminated soils above removal action levels in the surficial 4 feet. In several major source areas, excavation proceeded to depths of 8 to 10 feet; although, large volumes of deeper soil still contain NAPL and high concentrations of Site contaminants. Approximately 32,604 tons of contaminated soil and debris were excavated and disposed of off-site at permitted landfills. A total of 33,128 tons of clean sand was imported from an off-site quarry to backfill the excavation pits.

Documentation, record drawings, and a detailed summary of the soil removal construction activities are provided in the document titled Phase 1 Soil Remedial Action Summary Report (E & E, November 1999).

Upland Soil Cap

The selected soil remedy requires capping upland areas where residual soil contamination remains above human health and ecological risk-based protective levels. Documentation, record drawings, and a detailed summary of the upland soil cap construction activities are provided in the document titled Upland Soil Cap Construction Summary Report (E & E, May 2006).

Construction activities for the upland soil cap were performed between March and September 2005 and included the following major components: demolition and off-site disposal of existing structures and infrastructure; reinstallation of key support facilities; construction of a 15-acre impermeable cap within the perimeter of the subsurface barrier wall; and construction of an earthen soil cap outside of the impermeable cap.

Demolition and removal were conducted from May through June 2005 and included the removal of all remaining structures and disposal of the generated waste in a State-approved disposal facility. All existing water, gas, and electrical utilities were removed or abandoned. Most fire hydrants were removed, any associated piping was grouted to prevent preferential flow paths, and water lines were capped. Demolition items were salvaged, scrapped, or disposed of as nonhazardous waste or hazardous waste. Concrete, creosote-contaminated steel, and asbestos-containing water pipe also were buried on-site. All on-site burial locations were surveyed. Twenty groundwater monitoring wells were abandoned.

Support facility construction was conducted from March to July 2005 and included the reinstallation of a 1-acre paved entrance road and parking area, construction of a 25-foot by 40-foot shop building, and reinstallation of electrical, telephone, and water services.

A 15-acre Resource Conservation and Recovery Act (RCRA)-type impermeable cap was constructed within the 18-acre area inside of the barrier wall. The only part of the 18-acre area within the barrier wall that does not have a RCRA-type cap is the riparian zone that borders the river. Capping of the riparian zone with an earthen cap was completed in 2004 as part of the sediment cap construction.

The purpose of the impermeable cap is to minimize infiltration of rainwater into the contaminated areas within the wall. The impermeable cap is composed of the following materials, listed in order from bottom to top and is shown in Figure IV-1.

- 8,000 cubic yards of sand used as a leveling layer about 4 inches thick.
- 72,000 square yards of high density polyethylene (HDPE) geomembrane liner, which prevents water from flowing vertically into the contaminated aquifer.
- 72,000 square yards of a geocomposite plastic 'fabric' drainage layer that allows water to flow to the stormwater drainage system.
- 47,000 cubic yards of sand of varying depths to allow for drainage.
- 12,000 cubic yards of 4"-minus crushed rock, forming a screened biotic barrier layer approximately 6 inches thick.
- 72,000 square yards of geotextile filter fabric.
- 24,000 cubic yards of topsoil placed approximately 9 to 12 inches in depth.
- 20 species of native grasses to provide a diverse and sustainable herbaceous cover, thus minimizing surface erosion.

The impermeable cap has a minimum thickness of 29 inches; the thickness varies because of varying subgrade and the final grade of the Site. The sand drainage layer increases in depth to create the grades necessary to achieve Site drainage. The maximum thickness of the cap is approximately 7 feet, which includes a 4-inch-thick sand leveling layer, a 62-inch-thick sand drainage layer, a 6-inch-thick rock biotic barrier, and 12 inches of topsoil.

The impermeable cap also consists of a subsurface drainage system above the HDPE liner to collect stormwater percolating through upper soil, rock, and sand layers of the cap. Stormwater is collected in the geocomposite fabric and perforated piping and conveyed by gravity flow through conveyance piping to an outfall structure, which daylights at approximately the ordinary high water (OHW)[2] level of the Willamette River.

An earthen soil cap, consisting of a 2-foot-thick layer of imported topsoil, was installed over 19 acres of the Site outside of the barrier wall area, excluding the gravel entrance road and parking area (1 acre). An additional 6 acres of earthen cap were installed over the riparian zone during construction of the sediment cap. The total area of earthen cap is 25 acres, and includes some of the BNSF right of way. The purpose of the earthen cap is to prevent direct contact with low-level contamination remaining in the soils throughout the rest of the Site. The soil layer is underlain with a demarcation layer consisting of orange HDPE safety fencing to provide a distinction between the clean soil cap and contaminated soil. The earthen soil cap was seeded with native herbaceous vegetation.

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[2] OHW at the Site is +20 feet NAVD. OHW is defined at ORS 274.005.

A stormwater management system was constructed to minimize stormwater runoff from the Site to neighboring properties and the Willamette River. This system consists of a swale that conveys stormwater directly to an on-site retention/infiltration pond. Except for the 6-acre riparian zone, the surface of the upland soil cap (including both the earthen and impermeable caps) is constructed with sloped surfaces (approximately 1 percent slope) to direct surface water runoff toward the drainage swale. Rainwater falling onto the riparian zone, which generally has a slope of 25 percent, flows overland toward the river and/or infiltrates into Site soil and groundwater.

A 6-foot-high, chain-link fence topped with barbed wire also was reinstalled along the McCormick & Baxter Property perimeter. Along the riverfront, the fence is located 35 feet inland from the top of bank. Gravel access ways and roads were constructed around the perimeter of the McCormick & Baxter Property (except along the north side where the drainage swale is located), with spurs that cross the interior area to allow monitoring and maintenance of the Site in those locations. Warning signs were placed along the perimeter of the McCormick & Baxter Property.

Several thousand native trees and shrubs were planted throughout the drainage swale and riparian zone in February 2006, and a temporary, aboveground irrigation system was installed in May 2006. No trees are planted overtop the impermeable cap within the barrier wall. The purpose of this vegetation, along with the native grasses, is to help stabilize the soil against stormwater erosion and river flood erosion, and to reduce rainwater percolation into groundwater by evapotranspiration.[3]

Sediment Remedy

The sediment remedy is composed of two primary components: ICs and a sediment cap. The RAOs for the sediment cap are:

- Prevent humans and aquatic organisms from direct contact with contaminated sediments.
- Minimize releases of contaminants from sediment that might result in contamination of the Willamette River in excess of federal and state ambient water quality criteria.

The first RAO is designed to prevent human exposure under a recreational scenario from direct contact with contaminated sediments and to prevent exposure of benthic organisms to sediment contamination above known toxicity levels[4].

The selected sediment remedy consists of capping areas that contain contaminant concentrations above human health and ecological risk-based protective levels or that exhibit significant toxicity to benthic organisms within the upper sediments. Construction of the sediment cap occurred in two separate phases:

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[3] Restoration and maintenance of the riparian zone is required by the Biological Opinion issued by the National Marine Fisheries Service, pursuant to Section 7 of the Endangered Species Act.

[4] At the time of the ROD, no state or federal sediment quality criteria existed. However, bioassay results indicated that a substantial area of near-shore sediment contamination was toxic to sedentary benthic invertebrates (bioassay testing measured organism survival and weight, see Sediment Cap Basis of Design). These areas coincided with areas that exceeded human risk-based goals. Sediment with concentrations above levels protective of human health or toxic to benthic organisms (based on sediment bioassay tests resulting in impaired survival and growth (i.e., weight)) were capped.

June through November 2004[5] and August through October 2005. Documentation, record drawings, and a detailed summary of the sediment cap construction activities are provided in the documents titled Remedial Action Construction Summary Report Sediment Cap (June 2004 through November 2004) and Remedial Action Construction Summary Report Sediment Cap Completion (August 2005 through October 2005), both prepared by Ecology & Environment, Inc. (E&E) for DEQ and EPA in May 2006.

Construction activities in 2004 consisted of the following major components:

- Removal of approximately 1,630 pilings, bulkhead, dock remnants, in-water debris, a derelict barge in Willamette Cove, and other Willamette Cove features
- Construction of a multi-layer sediment cap using sand, organophilic clay, and armoring
- Monitoring well abandonment and modification
- Bank regrading and capping
- Disposal and demobilization

The sediment cap footprint constructed in 2004 encompassed approximately 22 acres. Its shoreward boundary extends along the shoreline from the south end of the property downstream into Willamette Cove to the north. Its riverward boundary at the farthest offshore location extends into the Willamette River to an approximate elevation of -40 feet NAVD, outside of the limits of the U.S. States Army Corps of Engineers (USACE) designated navigational channel, and to -16 feet NAVD in Willamette Cove. The cap consists of a 2-foot-thick layer of sand over most of the cap footprint with a 5-foot-thick layer of sand over several more highly contaminated areas. Approximately 131,000 tons of sand were placed from July 7 through October 28, 2004.

Within the cap footprint were areas of known NAPL migration (e.g., seep areas). In the Willamette Cove and TFA NAPL seep areas, the cap incorporated 600 tons of organophilic clay to prevent breakthrough of NAPL through the cap. Organophilic clay is bentonite or hectorite clay that has been modified to be hydrophobic and to have an affinity for organic compounds. The organophilic clay was applied in bulk and in the form of Organoclay™ reactive core mats (RCMs).

The sediment cap incorporated different types of armoring to prevent erosion of the sand and organophilic clay layers. The specific armoring material and where it was installed depended on the expected hydraulic and physical environments (e.g., currents, wave energy, erosive energies, etc.). Articulated concrete block (ACB) mats were installed along the shore and in shallow water where erosive forces would be the greatest because of wave action. ACB is composed of individually formed, interlocking concrete blocks. Rock armor included 6”-minus, 10”-minus, and riprap. All shallow water 10”-minus and ACB armoring layers were underlain with a woven geotextile fabric and a 4-inch-thick layer of 3”-minus filter rock. This fabric and rock layer was installed to hinder the migration of the sand through the larger and more porous armoring layer or layers. A cross-sectional view of the sediment cap is shown in Figure IV-2.

[5] This phase of the sediment cap construction also included regrading and capping of the riverbank to create the 6-acre riparian zone. Although construction of the riparian bank cap is described as part of the sediment cap remedy, long-term operation and maintenance of the riparian zone will be conducted as part of the upland soil cap.

ACB installation began on July 7, 2004, and proceeded from the downstream end of the Site in Willamette Cove to the upstream work limits. Installation of ACB mats was allowed only after the subgrade, including sand cap and gravel filter layer, was verified by DEQ's construction oversight contractor. ACB installation was completed on October 28, 2004.

The 6"-minus rock was basalt and/or andesite. Approximately 23,250 tons of 6"-minus cobble were placed over the sand cap and as edge treatment where the 6"-minus cobble areas abutted the ACB. The 10"-minus rock used as armoring also is composed of angular basalt and/or andesite. Approximately 23,300 tons of 10"-minus rock placed in the near-shore embayment. The riprap material used for construction of the boulder clusters and the rock mound is composed of durable angular boulders less than 3 feet in diameter.[6] Approximately 558 tons of riprap were placed along the shoreline and on an offshore shoal between the embayment and the river at the Site. Each boulder cluster consisted of six to seven boulders.

Eighteen monitoring wells located within the 6-acre riparian zone were abandoned (e.g., boreholes were overdrilled and grouted with bentonite), and 36 monitoring wells were modified in accordance with Oregon Water Resources Department requirements (e.g., well casing added to and surface casing raised to accommodate soil cap thickness).

The 6-acre riparian zone was created by regrading of the riverbank, placement of a demarcation layer, placement and grading of a 2-foot-thick layer of imported clean fill (topsoil), placement of a turf reinforcement mat, and hydroseeding with native grasses.

During initial construction of the sediment cap, two City of Portland pressurized sewer lines were found exposed within the sediment capping area. The City of Portland was informed of the situation, and a no-work zone was established along a 120-foot swath of the sewer lines. These lines were stabilized by the City of Portland in July 2005. Construction of this remaining 1-acre sediment cap was resumed in August 2005, completed in September 2005, and consisted of placement of the following major components[7]: 8,950 tons of sand; 460 tons of 3"-minus filter rock; 1,711 tons of riprap; 2,850 tons of 6"-minus rock; and 1,240 tons of 10"-minus rock. The riprap material was used in place of the ACB to provide stability against wave action along steep portions of the shoreline, between elevations of approximately +8 NAVD and -2 NAVD.

Construction activities in 2005 also included the installation of 24,150 square feet of Organoclay™ RCMs as a corrective measure to address releases of NAPL sheens discovered during weekly inspections following cap construction in 2004. These corrective measures are discussed in later sections of this Five-Year Review. The Organoclay™ RCMs were placed in three areas along the shoreline: under the BNSF Bridge (6,000 square feet); downstream of the previously Organoclay™-capped TFA seep (150 square feet); and upstream of the previously Organoclay™-capped TFA seep (18,000 square feet). The Organoclay™ RCMs were covered with sand and rock armoring.

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6 The boulder clusters are intended to provide aquatic habitat diversity while the rock mound is intended to lower hydraulic energy within the shallow water embayment area.

7 These quantities include construction associated with the corrective measures performed in August and October 2005 as discussed in the following paragraph.

Groundwater Remedy

The groundwater remedy has four components: ICs, a subsurface barrier wall, NAPL recovery, and evaluation of innovative technologies for NAPL recovery. The RAOs for the groundwater remedy are:

- Prevent human exposure to or ingestion of groundwater with contaminant concentrations in excess of federal and state drinking water standards or protective levels.
- Minimize further vertical migration of NAPL to the deep aquifer.
- Prevent groundwater discharges to the Willamette River that contain dissolved contaminants that would result in contaminant concentrations within the river in excess of background concentrations[8] or in excess of water quality criteria for aquatic organisms.
- Minimize NAPL discharges to the Willamette River beach and adjacent sediment.
- Remove mobile NAPL to the extent practicable to reduce the continuing source of groundwater contamination and the potential for discharge to Willamette River sediment.

Creosote Recovery

Creosote (i.e., NAPL) recovery began in 1989 as a Removal Action. Approximately 450 gallons were recovered between July 1989 and November 1991. By February 1995, more extraction wells had been added to the system, and approximately 1,800 additional gallons of NAPL had been removed. Since the issuance of the ROD in March 1996, NAPL recovery has continued through July 2011. Approximately 6,500 gallons have been recovered from the Site since 1989.

Since the McCormick & Baxter Creosoting Company ceased operations in 1991, various extraction methods have been attempted to optimize NAPL recovery. The goal of extraction is to remove and deplete NAPL pools to residual levels to minimize or prevent migration into the Willamette River. Key NAPL extraction activities are summarized below:

- 1998: The treatment system in the TFA was modified again. Previously, total fluids extracted from three wells were conveyed to the former pilot treatment system and treated by a dissolved air flotation system. This system required extensive oversight and was expensive to operate (e.g., chemical costs). The system operated 40 hours per week (Monday through Friday) when a technician was on-site to perform operation and maintenance activities. To allow for continuous operation and to reduce costs and operator requirements, the system was replaced with one resembling that employed in the FWDA; this consisted of an oil/water separator, an in-line anthracite/clay filter, two granulated activated carbon units, and a metals treatment unit.
- 1999 and 2000: The volume of NAPL extracted by the automated systems was found to be similar to the volume removed via manual extraction using skimmers. In addition, it was determined that manual extraction could be conducted for approximately half the cost of operating the automated systems. Therefore, the FWDA and TFA NAPL extraction systems were shut down in September 2000, and NAPL extraction was continued manually.
- 2004 – 2011: Select wells inside and outside the barrier wall were monitored weekly for the presence and thickness of NAPL. NAPL was extracted weekly from these wells if the NAPL

[8] There is an issue associated with this RAO that relates to Alternate Concentration Limits (ACLs) defined in the ROD. This issue is further discussed in Sections VIII and IX of the 2006 Second Five-Year Review Report.

thickness within the well was sufficient for recovery (i.e., 0.4 foot for LNAPL and 1.5 feet for dense NAPL [DNAPL]).

Subsurface Barrier Wall

As required by the ESD, a fully encompassing, impermeable subsurface barrier wall was designed and installed to meet the RAO of minimizing NAPL discharges to the Willamette River. More specifically, the barrier wall was designed to cut off much of the upgradient sources of DNAPL and LNAPL in the TFA and FWDA, and to reduce NAPL migration from these areas to the river. The subsurface barrier wall was designed to surround as much of the TFA, former CPA, and FWDA as practical. Before construction began, the wall had to be moved to avoid the City of Portland's high-pressure sewer main along the BNSF right-of-way and the location of the Willamette River resulting in an area with subsurface mobile creosote in the FWDA being stranded outside the barrier wall. With respect to the Willamette River, the barrier wall was placed as close to the river as possible while not resulting in an (aboveground) bulkhead or an overly steep bank treatment when grading and capping the riverbank to cover the barrier wall. On average, following grading and capping of the riverbank, the river-front segment of the barrier wall is located at approximately 30 feet landward from OHW. The top elevation of the barrier wall along the river-front segment is approximately 23 feet NAVD (3 feet above OHW and 2 feet below the 10-year flood elevation).

The subsurface barrier wall was constructed from April through September 2003, with the exception of eight sheet piles that met refusal before achieving design depth. The resulting gaps were pressure grouted in July 2004. The construction of the barrier wall is documented in the report titled *Remedial Action Construction Summary Report, Combined Sheet Pile and Soil-Bentonite Barrier Wall* (E & E, July 2004).

The barrier wall was constructed to fully encompass 18 acres of NAPL-impacted groundwater and the main contaminant source areas at the Site, including the TFA and FWDA. The total length of the wall is 3,792 linear feet, and the depth varies from approximately -25 to -45 feet NAVD (45 to 80 feet bgs) to account for differences in the topography and soil profile at the Site. This depth (-45 feet NAVD) is below the depth of the Willamette River adjacent to the Site.

A 1,440-foot-long segment of the barrier wall along the bank of the Willamette River was constructed using steel sheet piles. Installation methods involved a panel-driving technique, which consisted of setting and partially driving six to eight sheet pile pairs (a panel).

A 2,355-foot-long segment of soil-bentonite barrier wall was installed to depths of up to 80 feet bgs to the side and upgradient of the primary contaminant source areas. The excavated trench was held open using a slurry mix of bentonite and water, which was later displaced by the denser soil-bentonite mixture. The mixing operation occurred concurrently with excavation within the wall's perimeter. The soil-bentonite mixture consisted of soil excavated from the trench, slurry from the trench, imported clayey soil, and dry bentonite. The mixing and placement were accomplished by an excavator and bulldozer.

The segment of wall between the Willamette River and the TFA (approximately 900 linear feet) is keyed into a silt aquitard and extends to a depth of approximately 70 to 80 feet bgs. The segment of barrier wall between the Willamette River, Willamette Cove, and the FWDA (approximately 1,100 linear feet) is a "hanging wall" because deeper soil in this area consists of interbedded sand and silt lenses with no continuous, competent aquitard to key into. This segment of the wall extends to a depth of 70 to 80 feet bgs. The segment of the wall located upgradient and cross-gradient of the TFA and FWDA (1,800 linear feet) is keyed into the silt aquitard and has a depth of 45 feet bgs.

Although the barrier wall segment located downgradient of the FWDA does not key into a continuous, competent aquitard, the depth of this segment of the wall serves to increase the distance between the DNAPL source and the river, thereby reducing the potential for continued flow of mobile NAPL.

Engineering and Institutional Controls

The ROD specifies ICs for the soil, groundwater, and sediment remedies:

- Physical restrictions[9] (e.g., fencing), warning signs, and safety measures until completion of the remedies
- Controls on future uses of the property so that they are consistent with the level of protectiveness achieved by the cleanup
- Prohibition on any use of the shallow and intermediate aquifers and prohibition on drinking water use of the deep water aquifer
- Prohibition on disturbance of the sediments

DEQ currently maintains a perimeter fence around the McCormick & Baxter Property and warning signs, and restricts public access to the upland portion of the Site. Public access to the beach is not restricted. Although not all monitoring wells are located within the fence, all wells have locked, steel monuments. These physical Site restrictions will be maintained into the foreseeable future. DEQ also has obtained a permanent easement for the sediment cap from the Oregon Department of State Lands. This easement prohibits the anchoring and grounding of non-recreational vessels and the use of all motor propelled vessels, and specifies that the sediment cap may be closed to all public uses if DEQ determines that the area poses a threat to public health or the environment. DEQ initially placed temporary buoys along the perimeter of the sediment cap warning boaters of navigational hazards. Permanent buoys were installed in August 2011. DEQ worked with the U.S. Coast Guard (USCG) to establish a Regulated Navigational Area (RNA) in and around the sediment cap pursuant to CFR Title 33, Part 165. On February 4, 2009, the USCG published the final rulemaking formally establishing the RNA for the McCormick & Baxter Site sediment cap (docket number USCG-2008-0121; Attachment 1 to this Third Five-Year Review). This rule became effective on March 6, 2009.

Restrictions through proprietary control are planned to be completed. These restrictions will prohibit development within the 6-acre riparian zone along the riverbank as required by the Endangered Species Act Biological Opinion issued by the National Marine Fisheries Service (NMFS), prohibit use of Site groundwater as specified by the ROD, and limit excavation of Site soils unless authorized by DEQ. Conditions to prohibit future uses of the Site will be completed to achieve the level of long-term remedy protectiveness required by the ROD.

A License or Access Agreement, completed in March 2005 between DEQ and BNSF, requires BNSF to notify DEQ in the event planned construction or maintenance activities in the right-of-way that could potentially cause damage to the portion of the upland soil cap located in the BNSF right-of-way. The

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9 EPA has since clarified that physical restrictions are considered engineering controls.

License is a contract between DEQ and BNSF that is expected to effectively restrict BNSF's activities in the right-of-way, and serve as an institutional control for protection of the soil cap remedy. The License does not restrict groundwater use or contain provisions to protect any wells installed for the McCormick & Baxter Site in the BNSF right-of-way. DEQ and EPA plan to complete the required IC for groundwater beneath the BNSF property.

OPERATION AND MAINTENANCE

DEQ conducted site activities in accordance with the Draft O&M Plan (DEQ, 2007), prepared by DEQ and approved by EPA. The Draft O&M Manual (E&E, 2007b; revised Hart Crowser/GSI, 2010b) specifies the sampling and monitoring procedures, quality assurance and quality control, and technical information needed to implement the Draft O&M Plan.

SOIL REMEDY

The soil remedy consists of contaminated soil removal and construction of an upland soil cap on approximately 40 acres of the Site and ICs. The soil cap remedy was completed in September 2005. Long-term monitoring is necessary because soils beneath the cap remain contaminated with arsenic, PCP, PAHs, dioxins, and NAPL. The performance standards for the soil cap are specified in the Draft O&M Plan and are as follows:

- Maintain contaminant concentrations in surface soil below the following risk-based clean-up goals, as specified in the ROD (EPA, 1996):
  - Arsenic – 8 milligrams per kilogram (mg/kg)
  - PCP – 50 mg/kg
  - Total carcinogenic PAHs (cPAHs) – 1 mg/kg
  - Dioxins/furans – 0.00004 mg/kg
- Maintain the topsoil layer to within 50 percent of its design specification:
  - Area over impermeable geomembrane cap – maintain thickness of at least 6 inches
  - All areas, except over impermeable geomembrane cap – maintain thickness of at least 12 inches
- Minimize infiltration of rainwater within the subsurface barrier wall by maintaining a subsurface stormwater conveyance system.
- Minimize stormwater erosion and surface water ponding by maintaining Site grading, surface stormwater conveyance, and native vegetation.
- Maintain native vegetation within the 6-acre riparian zone for compliance with the NMFS Biological Opinion (NOAA, 2004).

Monitoring activities for the soil cap (including the riparian zone) include visual inspections of the cap surface, stormwater conveyance system, security fencing, and warning signs. The soil cap is designed to be generally maintenance free, except for maintaining the native vegetation. Routine maintenance includes semi-annual manual removal of invasive plants and targeted application of herbicides. Non-routine maintenance may include repairs of the fence, replacement of warning signs, repairs of the gravel roads, filling of potential animal burrows, removal of sediment from manholes, and replanting of unsuccessful trees and shrubs. Site activities completed since the Second Five-Year Review (DEQ, 2006) are summarized in Table IV-1.

SEDIMENT REMEDY

The sediment remedy consists of a 23-acre cap over contaminated sediments within the Willamette River and ICs. The sediment cap remedy was completed in September 2005. Long-term monitoring and maintenance are necessary because sediments beneath the cap remain contaminated with arsenic, PCP, PAHs, dioxins, and NAPL. The performance standards for the sediment cap, specified in the Draft O&M Plan, are as follows:

- Maintain contaminant concentrations in surface sediments below the following risk-based cleanup goals, as specified in the ROD (EPA, 1996):
  - Arsenic – 12 mg/kg, dry weight
  - PCP – 100 mg/kg, dry weight
  - cPAHs – 2 mg/kg, dry weight
  - Dioxins/furans – 8×10^{-5} mg/kg, dry weight
  - Protection of benthic organisms based on sediment bioassay tests, resulting in impaired survival and growth (i.e., weight)
- Prevent visible discharge of creosote to the Willamette River.
- Minimize releases of contaminants from sediment that might result in contamination of the Willamette River in excess of the following federal and state ambient water quality criteria (AWQCs):
  - Arsenic (III) – 190 micrograms per liter (μg/L)
  - Chromium (III) – 210 μg/L
  - Copper – 12 μg/L
  - Zinc – 110 μg/L
  - PCP – 13 μg/L
  - Acenaphthene – 520 μg/L
  - Fluoranthene – 54 μg/L
  - Naphthalene – 620 μg/L
  - Total cPAHs – 0.031 μg/L
  - Dioxins/furans – 1×10^{-5} nanograms per liter (ng/L)
- Maintain the armoring layer to within 50 percent of the design specification:
  - 6-inch rock armoring – maintain thickness of at least 6 inches
  - 12-inch rock armoring – maintain thickness of at least 7.5 inches
  - 24-inch rock armoring – maintain thickness of at least 12 inches
- Maintain uniformity and continuity of ACB armoring.
- Maintain at least 20 percent excess sorption capacity of the organophilic clay cap.

The AWQCs listed above are the surface water criteria in effect at the time of the ROD; however, since completion of the ROD, additional recommended EPA water quality criteria have been published. During meetings in August 2007 between stakeholders (DEQ, EPA, National Oceanic and Atmospheric Administration [NOAA], Warm Springs Tribe, and Yakama Nation), it was agreed that for comparison purposes, five additional criteria would be included in analytical results summary tables in the Annual O&M Reports:

- Two AWQCs in effect at the time the ROD was issued
  - 1996 criteria for chronic effects to aquatic life

  - 1996 criteria for human health, based on fish consumption
- Two 2007 National Recommended Water Quality Criteria (NRWQCs)
  - 2007 criteria for chronic effects to aquatic life
  - 2007 criteria for human health (consumption of organisms)
- Current maximum contaminant levels (MCLs).

The comparison criteria are listed in Table IV-2.

Monitoring activities for the sediment cap in the past five years included visual inspections of near-shore areas, multi-beam bathymetric surveys, side-scan sonar surveys of deeper areas, and diver inspections of areas of concern identified from the bathymetry and sonar surveys. Ten surface water, inter-armoring water, and sub-armoring water sampling events have been conducted since the Second Five-Year Review. Sampling of subsurface sediment and sediment cap, bulk organophilic clay, Organoclay™ RCM, and crayfish has also been conducted to determine sediment cap performance. Bulk sediment samples are not collected because the sediment cap physically isolates riverbed contaminants and also prevents migration of potentially mobile contaminants within the riverbed sediment and NAPL seep areas to the Willamette River. Although the sediment cap is designed to be generally maintenance free, unplanned or non-routine maintenance has included: the replacement of temporary warning buoys, placement of additional armoring, and placement of organophilic clay RCMs. Site activities completed since the Second Five-Year Review are summarized in Table IV-1.

Groundwater Remedy

The groundwater remedy consists of groundwater monitoring, NAPL recovery, a subsurface barrier wall surrounding approximately 18 acres within the upland soil cap, and ICs. The barrier wall was completed in July 2004. Long-term monitoring is necessary because groundwater both inside and outside of the subsurface barrier wall remains contaminated with metals, PCP, PAHs, dioxins, and NAPL. The performance standards for the subsurface barrier wall and NAPL recovery, as stated in the Draft O&M Plan, are as follows.

- Continue to recover NAPL from outside the subsurface barrier wall until recovery rates become minimal, alternative pumping strategies have been examined and/or field tested with poor results, and remaining NAPL does not pose a threat to the Willamette River and its sediments.
- Maintain contaminant concentrations in shallow, downgradient compliance wells (or sediment pore water) below ACLs set forth in the ROD:
  - Arsenic (III) – 1,000 μg/L
  - Chromium (III) – 1,000 μg/L
  - Copper – 1,000 μg/L
  - Zinc – 1,000 μg/L
  - PCP – 5,000 μg/L
  - Total PAHs – 43,000 μg/L
  - Dioxins/furans – 0.2 ng/L
- Minimize the transport of NAPL and communication of groundwater zones across the subsurface barrier wall.
- Minimize further vertical migration of creosote to the deep groundwater aquifer.
- Minimize visible discharge of creosote to the Willamette River.

- Maintain contaminant concentrations in the Willamette River below background concentrations or less than the sediment cap performance standards for surface water.

The ROD specified site-specific ACLs for the Site. In the Second Five-Year Review, EPA determined that ACLs were not valid as substitutes for MCLs in groundwater. Invalidation of ACLs also affects whether the groundwater RAOs derived from the provisions in CERCLA for using ACLs remain valid for the Site. As a result of this determination, DEQ and EPA anticipate that amended groundwater cleanup goals for the Site will be established in a ROD Amendment to be consistent with CERCLA and the NCP.

Site activities in the past five years for the groundwater remedy have included NAPL monitoring and recovery, groundwater elevation monitoring, and groundwater sampling. Routine maintenance of equipment and providing for Site utility service are also included as elements of groundwater O&M. Site activities completed since the Second Five-Year Review are summarized in Table IV-1.

V. PROGRESS SINCE LAST FIVE-YEAR REVIEW

This section summarizes the status of recommendations and follow-up actions, the protectiveness determinations, and the progress made since the Second Five-Year Review to demonstrate that the selected Site remedy, described in Section IV, is effectively meeting the RAOs and cleanup goals identified in the ROD. The data discussed in this section also form the basis for the technical assessment, conclusions, and protectiveness determinations for this Third Five-Year Review.

STATUS OF RECOMMENDATIONS, FOLLOW-UP ACTIONS, AND THE PROTECTIVENESS DETERMINATION FROM THE SECOND FIVE-YEAR REVIEW

Table V-1, below, summarizes the issues, recommendations, and follow-up actions from the Second Five-Year Review.

At the time of the Second Five-Year Review, the protectiveness determination of the remedy for all the OUs was deferred pending collection of additional information. Further information was to be obtained by taking the following actions:

- Chemical analysis of Willamette River surface water, sediment cap armoring flow chamber water, and sediment cap sub-armoring pore water
- Inspections of near shore areas for the presence of NAPL releases from the sediment cap

These actions were expected to take two years to complete, after which the protectiveness determination would be made. It took more time than anticipated to complete the actions identified in the Second Five-Year Review. In addition, other potential concerns about the remedy were identified, investigated, and evaluated, which caused further delays. This section of the report summarizes the work that has been conducted and data collected and evaluated to support a protectiveness determination as part of this Third Five-Year Review.

Table V-1. Status of Recommendations and Follow-Up Actions from the Second Five-Year Review

Issue	Recommendations/ Follow-up Actions	Status
Lack of Post-Construction Performance Data	Perform extensive monitoring through December 2010. Use data for updating 2008 protectiveness determinations. Use data for conducting Third Five-Year Review in 2011.	Extensive monitoring was performed through 2010 as documented in the Annual Reports. Protectiveness determination addendum was not completed because additional investigation and monitoring data were being collected and reviewed. Monitoring data collected during the past 5 years was used in conducting the Third Five-Year Review.
Alternate Concentration Limits[a]	Revise Draft O&M Plan to address the invalidation of ACLs. Address alternative approaches to groundwater ACLS.	The ACLs have not been replaced with revised groundwater cleanup goals; therefore, the Draft O&M Plan was not revised or finalized. Replacing ACLs with revised groundwater cleanup goals is being evaluated. .
Implementation of ICs	Continue to implement remaining ICs	Engineering controls and the sediment cap ICs have been implemented and are functioning as intended. RNA was established March 6, 2009.
Minor Erosion of Soil Cap	Perform continued inspections soil cap.	Inspections are conducted quarterly and soil cap maintenance is performed on a routine basis or as needed.

Notes:

[a] See more detailed discussion of the ACL issue in Sections VIII and IX of the Second Five Year Review Report, September 2006.

SUMMARY OF IMPLEMENTED ACTIONS AND RESULTS

Since the Second Five-Year Review, EPA and DEQ have budgeted $2.7 million through a cooperative agreement to implement and perform remedial action activities. The primary remedial action activities at the Site included:

- Conducting activities outlined in the October 2007 Draft O&M Plan to ensure that the soil, sediment, and groundwater remedies are protective of human health and the environment.
- Conducting focused studies based on observations from the inspections to determine whether the remedy components are effective and protective.
- Site activities completed since the Second Five-Year Review are summarized in Table IV-1. Routine Site activities included maintenance of equipment, engineering and ICs, vegetation management, and soil and sediment cap inspections. During the review period (October 2006 through September 2011), soil and sediment cap inspections were conducted monthly, with

additional weekly sediment cap inspections from July through October. Details of Site inspections and routine activities are documented in the Annual O&M Reports (E&E, 2007a and 2008; Hart Crowser/GSI, 2009, 2010c, and 2011). A summary of key activities conducted since the Second Five-Year Review is provided below.

NAPL Recovery and Thickness Assessment (2006-2011)

NAPL thickness measurements and NAPL recovery were performed during the past five years. As part of the site-wide low-tide monitoring of groundwater levels, NAPL presence and thickness were measured quarterly in all Site wells from 2006 through 2009, and semi-annually thereafter. Figure V-1 shows Site monitoring wells and locations where NAPL was detected in the last five-year period. With the exception of well EW-1, NAPL was not discovered in any Site well where it was not already present in 2005, and thicknesses of NAPL in wells, although they vary seasonally, have remained generally consistent.

Approximately 6,500 gallons of NAPL have been recovered from Site wells since 1989, and the rate of recovery decreased significantly after construction of the upland cap in 2005. Approximately 353 gallons of NAPL were extracted during the Five-Year Review period. The bulk of that volume was extracted from exterior well MW-20i, with smaller amounts from exterior wells MW-Ds and MW-Gs. Well EW-1s contributed approximately 37 percent of the total volume extracted from July 2009 to April 2011. Figure V-2 shows the cumulative extracted volume of NAPL since recovery began in 1989. Results of NAPL monitoring activities for this review period are documented in the 2006 through 2010 Annual O&M Reports.

DNAPL Data Gap Investigation (2011)

Since the installation of the barrier wall in 2003, DNAPL has been regularly detected during weekly NAPL gauging and recovery events in three monitoring wells (MW-20i, MW-Ds, and MW-Gs) located outside the barrier wall in the FWDA. The purpose of the DNAPL Data Gap Investigation was to assess the nature, extent, source(s), and potential pathway(s) of DNAPL to MW-20i to inform decision-making regarding DNAPL recovery outside the barrier wall. The focus of the investigation was on MW-20i because the bulk of the NAPL recovery outside the barrier wall comes from MW-20i, and the source(s) and pathway(s) of NAPL entering the well were not well understood.

DNAPL investigation activities were conducted in general accordance with the scope of work described in the February 2010 *Sampling and Analysis Plan (SAP) DNAPL Data Gap Investigation* (Hart Crowser/GSI, 2010a). The results of the investigation are presented in the *DNAPL Data Gap Investigation Report* (Hart Crowser/GSI, 2011).

As shown in Figure V-3, four borings were advanced surrounding well MW-20i to approximately 100 feet bgs (approximately 15 feet below depth of the boring advanced for installation of MW-20i) with continuous core collection. Based on the data gathered from the investigation, and previous investigations in the FWDA, there appear to be primarily two zones of residual product and one local zone with mobile DNAPL in the investigation area, in addition to evidence of historic NAPL pathways (NAPL stringers) expressed as thin layers of residual creosote staining.

The first zone of shallow residual NAPL was observed in borings SC0311 and SC0411. This is consistent with the ‘smear zone’ observed in the boring logs from previously installed nearby monitoring wells MW-Gs and MW-60d, and boring SC3604. Currently, product observed in this smear zone is residual and non-mobile. At wells MW-Ds and MW-Gs, in addition to a residual smear zone, there is a thin layer of mobile DNAPL overlying the silt layer. This is the source of recoverable NAPL to those wells. The DNAPL layer is thin and limited in extent; therefore, while it can be recovered through local wells, it is not a threat to the Willamette River.

The second zone of residual NAPL is present between approximately 85 and 100 feet bgs. A deeper zone of potentially mobile DNAPL was observed when well MW-20i was installed in January 1990. At that time, soil between 82 and 88 feet bgs (currently 87 to 93 feet bgs because of the addition of 5 feet of soil cap in that location) was described as “saturated with a creosote-like liquid.” Since that time, three additional investigations were conducted in that area, as described below.

In 2004, seven soil borings were advanced in the FWDA (three inside the barrier wall and four outside the barrier wall) to assess the extent and distribution of DNAPL contamination and to collect soil cores for NAPL mobility testing. As documented in Section 5 of the *Post Remedial Action Conceptual Site Model for NAPL Transport Report* (GSI, 2007), the boring log data from 2011 showing thin layers with moderate sheen supports the conclusion from 2004 that DNAPL in the FWDA is not present as a large pool in the subsurface. In the 2004 investigation, thin layers with slight to moderate sheen and odors were observed in isolated areas where DNAPL is observed.

In 2005, well MW-60d was installed adjacent to well MW-20i to better understand the distribution of NAPL in the subsurface in the vicinity of MW-20i. While there was stained soil in the smear zone, no zones of potentially mobile NAPL were observed between the smear zone and the total depth of 105 feet bgs, and no NAPL has entered the well since construction. MW-60d is screened from 80 to 100 feet bgs, in the zone where NAPL saturated soils were observed in MW-20i when drilled in 1991. Since NAPL has never been observed in this well, the NAPL stringers in the vicinity of MW-60d that were documented in previous investigations likely are depleted to residual saturations and support the evidence that there is not a NAPL threat to the Willamette River.

In the 2011 investigation, boring SC0411 was advanced adjacent to boring SC3604 (advanced in 2004 outside the barrier wall near well MW-20i), the only location where NAPL mobility testing in 2004 showed mobile NAPL outside the barrier wall. In 2011, there was no evidence of potentially mobile NAPL in SC0411, suggesting that mobile NAPL in the area of MW-20i has diminished in the last seven years, in part as a result of NAPL recovery.

None of the borings advanced surrounding well MW-20i in the past seven years showed any evidence of NAPL that could migrate to MW-20i. Therefore, the source and potential pathways of NAPL migration to MW-20i is considered to be limited (i.e., there is not a significant, large pool of NAPL recharging MW-20i). Although a source of NAPL to MW-20i was not identified, mobile product was not observed in the four soil borings surrounding the well that were advanced in 2011.

Findings from the DNAPL Data Gap Investigation, in conjunction with previous investigations in the FWDA are:

- Ongoing contributions of DNAPL to well MW-20i may be the result of a small localized pool or pools of mobile NAPL in the vicinity of MW-20i, but are not believed to be of significant quantity or mobility to threaten the Willamette River or exceed groundwater RAOs.

- While NAPL is expected to continue to slowly migrate downward in the subsurface; based on the large number of soil borings that have been advanced in the FWDA outside the barrier wall, there is no evidence of a larger source of NAPL that likely would threaten the Willamette River or exceed groundwater RAOs.
- For NAPL to migrate, NAPL saturations must be greater than residual saturation over a continuous path from the source to a potential discharge area. The NAPL recovery and investigative data to date suggest that although there are local pockets of mobile NAPL, as evidenced by the continued ability to recover NAPL from well MW-20i, there is no evidence of a significant continuous pathway through which NAPL will reach the Willamette River or exceed groundwater RAOs.

Based on these findings from the DNAPL Data Gap Investigation and extensive monitoring data from the sediment cap (described in subsequent sections), DEQ and EPA determined that NAPL recovery is no longer necessary at the Site.

Soil Cap Subsidence Monitoring (2008-2011)

In June 2008, the inner casing of monitoring well MW-23d was observed to be protruding approximately 4 inches above the well casing monument (outer well casing). Subsequent upland survey results confirmed that ground surface elevation subsidence had occurred in the vicinity of MW-23d. The Subsidence in Upland Cap Technical Memorandum (Hart Crowser/GSI, 2008) was prepared to present activities that would determine the vicinity of the subsidence and recommended actions. Additional subsidence monitoring was completed during the 2009 reporting period, including a stormwater conveyance system inspection, upland hub and well surveying (July through September 2009), well EW-1s groundwater and vapor sampling, and data interpretation. A detailed description of these activities with additional recommendations is presented in the Additional Subsidence Monitoring Memorandum (Attachment F to Appendix B of the 2008 Annual O&M Report [Hart Crowser/GSI, 2009]). Figure V-4 shows the areas of subsidence since the soil cap was constructed in 2005. Subsidence monitoring activities and results are described below.

Storm Drain

On March 27, 2009, Pacific Int-R-Tech videotaped the inside of stormwater piping extending from Manhole B to Manhole C, from Manhole C to Manhole E, and from Manhole E to the outfall. Two conveyance line sags were noted in the line between Manhole B and Manhole C. Although sagging is evident, the videotape did not reveal any signs of pipe stress, failure, or leaking. Based on the results of the video, elevation measurement, and stormwater discharge monitoring, the stormwater piping system continues to function properly.

Survey Results

As part of a broader Site surface evaluation to measure the extent of the subsidence, survey hubs were placed to monitor the ground elevation in 16 locations on the upland soil cap, and at several points along the storm drain line. The results of the survey show the most significant area of subsidence is very local near wells MW-23d and EW-1s and decreases with distance from these wells.

Elevation data were also collected for the top of inner and outer casing of wells MW-23d and EW-1s. Between July and September 2009, the MW-23d monument (outer casing) elevation declined by 0.013

feet, or 0.006 feet per month. In contrast, the well casing (inner casing) declined by 0.034 foot between September 2008 and September 2009 or approximately 0.003 foot per month. This suggests that the ground surface/monument was subsiding at approximately twice the rate of the well casing. The casing elevation for shallow EW-1s also has been declining. The EW-1s well casing dropped 0.027 foot in elevation between July and September 2009, or approximately 0.013 foot per month.

EW-1s Gas Sampling

During a Site visit in November 2008, a significant amount of vapor was observed when the lid to well EW-1s was opened. Ebullition from water in the well also was noted. Transducer data showed pressure head reading variation by as much as 0.7 foot between 30-minute intervals. Pressure induced by the periodic release of gas is likely the cause for the observed temporary changes in groundwater elevation in EW-1s. On May 18, 2009, an airtight well seal was placed on the well in preparation for gas sampling and analysis to determine the composition of gas within the well. Following an equalization period, both vapor (gas) and groundwater samples were collected on July 1, 2009. The samples were analyzed for carbon dioxide, carbon monoxide, oxygen, and methane.

The sample results indicate near homogenous mixing of in-well gases in an anoxic environment consisting of 44 percent carbon dioxide and 29 percent methane. The balance of gas is assumed to be nitrogen, based on composition of atmospheric gases as the source of vadose zone oxygen. Results of dissolved gas in groundwater samples reflect similar conditions; anoxic environment with elevated carbon dioxide and methane concentrations.

EW-1s Groundwater Sampling

Groundwater samples collected near the top and bottom of the saturated interval also were analyzed for Site contaminants and indicators of reductive activity. Analytical results were similar for both intervals. Significant concentrations of dissolved total organic carbon were present in both samples, ranging up to 45.5 milligrams per liter (mg/L). Both sample intervals contained detectable arsenic, iron, and zinc. Detected iron was essentially present only as the ferrous species, consistent with strong iron reducing and methanogenic conditions. Groundwater chemistry results confirmed that groundwater in the vicinity of well EW-1s was highly reductive.

Subsidence Conclusions

The survey results confirm that the upland cap is settling in the vicinity of wells MW-23d and EW-1s. Survey data collected from September 2008 through September 2009 suggested that upland cap ground settling is occurring at a rate of up to 0.015 foot per month. Since installation of the airtight seal on EW-1s and the stabilization of water levels within the barrier wall, subsidence has become minimal with no subsidence observed since June 2010.

Evaluation of vapor and dissolved gas results from 2009 suggested that oxygen was being introduced continually into the vadose zone in the vicinity of well EW-1s. This oxygen was utilized to microbiologically degrade organic carbon (wood debris) to produce carbon dioxide and methane gas. The EW-1s well cap was sealed in June 2010 so that oxygen would not enter the well. Since this action, there has been no evidence of gas release in the transducer data, groundwater temperatures have dropped to near normal levels, and minimal subsidence has occurred.

A contributing factor to the settling in the wood waste area is believed to be declining water levels. Depending on the rate of water level decline, this compression can be relatively fast and seemingly abrupt. Because shallow groundwater levels within the cap essentially have reached equilibrium with the Willamette River, additional changes in overburden pressure within the landfill mass are likely to slow. Further settling in the future may stress cap features (i.e., stormwater conveyance and well boots), potentially compromising the stormwater conveyance system. This area will continue to be monitored for subsidence.

Groundwater Flow Direction and Gradient Assessment (2006-2011)

Site-wide manual measurements of static groundwater levels were collected quarterly from 2006 through 2009 and semi-annually through 2011. Groundwater levels also were measured continuously using pressure transducers in select monitoring wells surrounding the barrier wall. Results of these activities are documented in Annual O&M Reports. Figure V-5 shows representative groundwater elevations measured in June 2010, demonstrating that shallow groundwater outside the barrier wall is diverted around the barrier wall to the northwest and south.

Observations based on the groundwater monitoring data include:

- ➢ Shallow groundwater elevations and gradients since the barrier wall was installed in 2003 have remained generally consistent.
- ➢ Horizontal gradients outside the barrier wall are the greatest during periods of high precipitation and decrease during periods of low precipitation.
- ➢ Groundwater gradients inside the barrier wall remain flat and generally to the west (except when peak river stage causes a reversal in gradient), while outside and upgradient of the wall, shallow groundwater flow is diverted around the barrier wall to the northwest and south.
- ➢ While most of the monitoring wells mimic the stage variations in the Willamette River, the oscillations in the shallow interior walls are delayed and muted and likely the result of changes in pressure at depth rather than a hydraulic connection to the river.
- ➢ Under stable river conditions, vertical groundwater gradient figures indicate that gradients are generally downward inside the barrier wall in the FWDA and former TFA, with the exception of an upward gradient during high tide in the former TFA.

Based on the observations made through the 2010 reporting period, it appears that the barrier wall and impermeable soil cap are functioning as designed: groundwater flow and rainwater infiltration are diverted around source areas contained within the barrier wall, and NAPL contained within the barrier wall is prevented from migrating to the Willamette River.

Infiltration Pond, MW-59s Groundwater Quality Assessment (2006-2010)

As a component of the soil cap, an infiltration pond was constructed at the southwestern corner of the Site to collect surface water runoff from the upland portion of the cap. Monitoring well MW-59s, located downgradient from the pond, has been monitored since installation to evaluate the potential for subsurface contaminants to be mobilized by the infiltration pond. Figure V-6 shows the locations of the infiltration pond and the monitoring well. Groundwater samples were collected at MW-59s biannually through 2007 and annually thereafter. Details of the monitoring activities are included in the Annual O&M Reports. The concentration data from all events, compared to MCLs, are shown in Table V-2, and concentration changes over time are shown in Figure V-7. Concentrations of PAHs, PCP, and metals are all well below MCLs and contaminants are not being mobilized via stormwater discharge to the infiltration pond.

Site-Wide Groundwater Quality Assessment (2006 and 2010)

Groundwater sampling was conducted at all monitoring wells at the Site in Spring 2006 to document post-remedial action dissolved groundwater concentrations of constituents of concern (COCs). A second round of sampling was conducted at select wells (MW-47s, MW-41s, MW-39s, MW-37s, EW-19s, MW-58s, MW-35r, MW-37i, MW-37d, MW-55s, and MW-53s) in May 2010. Detailed descriptions of the sampling events are included in the 2006 and 2010 Annual O&M Reports. Results of the two events were compared to drinking water MCLs, as shown in Table V-3. In general, the 2010 sample results were consistent with historical data showing either less or similar contaminant concentration compared to the 2006 results. Of the wells sampled in 2010, only two shallow wells (EW-19s and MW-37s) contained elevated levels of PAHs. Both of these wells are located outside the northwestern corner of the barrier wall in an area known to historically contain NAPL. These results are consistent with historical data and support the current understanding of contaminant occurrence and transport at the Site. In areas where residual NAPL is present, dissolved concentrations of COCs are elevated and expected to remain elevated as long as residual NAPL is present. However, the constituents are not migrating far from the area of residual NAPL, and based on sediment cap water quality monitoring, dissolved constituents are not reaching the Willamette River at concentrations above MCLs or AWQCs. The spatial distributions of total PAHs, benzo(a)pyrene, and PCP for the two monitoring events are shown in Figures V-8, V-9, and V-10.

Surface Water, Inter-Armoring Water, and Sub-Armoring Water Assessment (2005-2010)

Ten rounds of surface water, inter-armoring water, and sub-armoring water sampling have been conducted since the sediment cap was completed in 2005: Fall 2005 (only surface water and sub-armoring water), Spring and Fall 2006; Spring and Fall 2007; Spring and Fall 2008; Spring and Fall 2009; and Spring 2010. Water samples were collected from surface (collected from 1 foot above the sediment cap-water interface), inter-armoring (collected from the armoring layer of the sediment cap), and sub-armoring (collected from 6 inches into the sand portion of the sediment cap) depths. Pre-cap construction surface water and pore water sampling took place in 2002 and 2003. Results of these activities are documented in the Annual O&M Reports. Sample locations are shown in Figure V-11.

The surface water, inter-armoring water, and sub-armoring water sampling objectives are described in the Draft O&M Plan and the sampling procedures in the Draft O&M Manuals (E&E, 2007b; Hart Crowser/GSI, 2010c). Water samples were analyzed for the Site COCs:

- PAHs
- PCP
- Metals (arsenic, chromium, copper, and zinc)

Starting in Fall 2009, water was analyzed using solid phase micro-extraction (SPME). Passive sampling using SPME is a means of detecting interstitial concentrations of hydrophobic contaminants, such as PAHs, in that it provides a measure of truly dissolved concentrations with high spatial resolution and low detection limits. The SPME passive samplers consist of a thin layer of the sorbent polydimethylsiloxane (PDMS).

SPME samplers were placed at 13 sample locations that were co-located with conventional sampling methods (i.e., the methodology used for the past five years). Results of the sampling and comparison between the conventional and SPME sampling are included in the 2009 O&M Report. SPME technology results in:

- Significantly lower detection limits
- More representative samples that are equilibrated over a week's period
- Measurement of only the freely dissolved constituents
- Vertical contaminant profiles
- A reduced effort for obtaining the samples

Based on the results from the Fall 2009 sampling event, SPME was used in lieu of conventional sampling to measure inter-armor and sub-armor water quality within the sediment cap in Fall 2010. The SPME sampling was conducted in accordance with the University of Texas (UT) Sampling and Analysis Plan (Attachment A to Appendix D of the 2010 O&M Report).

Analytical results for COCs identified in the ROD for the Site were compared to the 1996 ROD AWQC, the most recent EPA NRWQC, and the most recent EPA National Primary Drinking Water Regulations (NPDWR). The comparison criteria are listed in Table IV-2.

Conventional Sampling Results

Summary tables and graphs were developed to show results from the 10 conventional sampling events since the sediment cap was installed in Fall 2005 (pre-cap surface water data from 2002 and 2003 also are presented). Tables V-4 to V-6 summarize the statistical results from pre- and post-capping sampling events for surface, inter-armoring, and sub-armoring water.

The mean for sampling events from 2002 through 2010 for total arsenic, total copper, total PAHs (TPAHs), and cPAHs is presented in Figures V-12 through V-14, respectively. The mean concentration and 95 percent upper confidence limit (UCL) were compared over time to evaluate overall contaminant concentration trends. The mean concentrations for total metals (arsenic, chromium, copper, and zinc) remained relatively stable between Fall 2002 and Spring 2010 at each depth measured (total arsenic and total copper time-series plots shown in Figure V-12). With the exception of copper, the sub-armoring water samples are consistently higher in concentration than the inter-armoring and surface water samples. This is typical for metals that are naturally occurring in sediment. Metal concentrations appear to be consistent with naturally occurring concentrations and have not changed significantly since installation of the sediment cap.

PCP was detected in surface water during the 2002 sampling event, but was not detected in most subsequent sampling events. PCP was detected at low levels, well below the comparison criteria listed in Table IV-2, in Fall 2006 in the inter-armoring samples; however, it was not detected again in the 2007, 2008, or 2009 events and was detected at a low level in one surface water and one sub-armoring water sample in 2010.

Total PAH concentrations in inter-armoring water and surface water have remained stable since installation of the sediment cap (Figure V-13). TPAHs are regularly higher in Fall surface water samples than in the Spring samples. River levels and discharge volumes are lower during the Fall time periods, and the higher concentrations in surface water may represent a greater contribution from the lateral discharge of groundwater. Concentrations of TPAHs in the sub-armoring samples are consistently about an order of magnitude more than the surface water and inter-armoring samples. The sub-armoring sample concentrations have had a decreasing trend since the sediment cap was installed. Again, the reduction in concentration between the sub-armoring and the overlying inter-armoring water and the decreasing trend in TPAH concentrations in the sub-armoring layer demonstrate that the sediment cap is performing as designed.

Concentrations of cPAHs have been fairly stable (Figure V-14) since 2006. Before 2010, summation of ½ the detection limits for non-detected cPAHs resulted in a mean concentration above the cPAH ROD reference criterion of 0.031 µg/L. In 2010, the laboratory achieved lower detection limits. The 2010 cPAH summation was below the reference criterion, even for the sub-armoring layer where few cPAHs were detected. Inter-armoring water and surface water have been primarily nondetect for cPAHs since the cap was installed. The clear reduction in cPAHs between the sub-armoring samples and the surface water and inter-armoring samples indicate that the sediment cap is functioning as designed.

Exceedances of comparison criteria are presented in Table V-7. The table summarizes the number of exceedances per sampling event at each sampling depth and for each constituent. It is clear that while there are periodic exceedances, the exceedances are not in the same locations and the number of exceedances for each sampling event is small. As discussed above, arsenic exceeds the comparison criteria because the MDL is higher than the comparison criteria.

Maximum detections are summarized for select analytes in Table V-8. In general, the maximum detected concentrations are relatively stable since installation of the sediment cap, particularly concentrations of metals (slightly higher in Spring 2010 inter-armoring water because of the higher concentrations thought to be associated with particulates at Location 6).

Table V-9 presents the detection frequencies by year and media. Detection frequencies for PAHs increase with depth. Surface water detections of PAHs from Fall 2005 through 2010 ranged from 19 to 68 percent of the sampling locations, while sub-armoring water detections ranged from 68 to 91 percent of the sampling locations. Detection frequencies for total metals generally were much higher than for PAHs, as would be expected as the metals are naturally occurring; however, no discernible pattern was observed between sampling events. This suggests that the presence of the metals is primarily the result of naturally occurring metals and not associated with the metals contamination associated with the wood-treating products used at the Site. Metals are detected in surface water and inter-armoring water at higher frequencies than in sub-armoring water. Arsenic is consistently detected in all layers with the exception of Spring 2008. Chromium, copper, and zinc are detected more frequently in 2010 because of lower detection limits.

The following conclusions are based on the post-sediment cap construction water sampling data:

- Metal sampling data suggest that metal concentrations are not the result of releases from the Site because there is little variation between sample location and depths. Concentrations are slightly higher in the sub-armoring layer; however, this is expected because the sub-armoring samples are of pore water and not surface water.

- With few exceptions, contaminant concentrations in surface water and inter-armoring water are consistently below both performance standards defined in the Draft O&M Plan and comparison criteria listed in Table IV-2, except for arsenic, a naturally occurring metal. In addition, exceedances of comparison criteria in the sub-armoring water are infrequent and vary in both location and constituent.
- PAH contaminant concentrations in surface water are higher in samples collected during Fall sampling, but are consistently below comparison criteria.

COC concentrations in surface water and inter-armoring water are generally below comparison criteria with the exception of arsenic for which the comparison criterion is below the MDL for arsenic. COC concentrations in the sub-armoring water are below comparison criteria with a few exceptions. Concentration trends are stable or decreasing. Based on water sampling from the surface water, inter-armoring and sub-armoring, the sediment cap appears to be protective and functioning as designed.

SPME Sediment Cap Monitoring

In Fall 2009, SPME passive samplers using PDMS were deployed at 13 locations co-located with conventional sampling locations. This was a trial to determine the comparability between conventional and SPME methods. The SPME had significantly lower detection limits for the high molecular weight PAHs (HPAHs) allowing cPAHs to be detected. The low molecular weight PAHs (LPAHs) were reasonably similar in concentration. During the 2010 Fall semi-annual sampling event, SPME passive samplers using PDMS replaced the conventional method and were deployed at 22 of the 22 locations overlying the sediment cap and the 2 background locations (surface water only). The SPME deployment locations are shown in Figure V-15. This established an SPME baseline for longer-term sampling. It is expected that SPME sampling may be conducted periodically (perhaps every 5 years) in select locations to determine long-term sediment cap protectiveness.

PAHs were measured at 6 inches into the armoring layer (similar to the inter-armor conventional sample), and 6 inches (similar to the sub-armoring conventional sample) and 12 inches into the sand cap layer. LPAHs were detected more frequently than HPAHs (chrysene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[b]fluoranthene and benzo[a]pyrene). The three most hydrophobic compounds (dibenzo[a,h]anthracene, and benzo[g,h,i] perylene+indeno[1,2,3-cd]pyrene) were not detected in any of the samples. Only LPAHs were detected at low concentrations in the two background surface water samples.

In-situ pore water PAH concentrations derived by SPME were compared to NRWQC, and analyzed for vertical concentration profiles and intrasite variability. Consistent with previous observations, two types of concentration profiles were observed in 2010 sampling. Uniform concentration profiles were present in samples located along the shoreline apparently the result of tidal action. Pronounced concentration gradients were observed in offshore locations suggesting more limited vertical mixing of contaminants. Concentrations were compared to NRWQC although the measurements were of pore water and not surface water; one exceedance of the NRWQC (18 ng/L) was observed for chrysene (35 ng/L) at 21 inches below the cap-water interface. A duplicate at 22 inches detected a concentration of only 5 ng/L. Benz[a]anthracene reached 80 percent of SWQC at Location 5 and 60 percent of SWQC at Location 16, both at the bottom of the cap layer. Other PAHs at all sample locations sites and depths were well below the SWQC. Thus, the sampling provided no evidence of contaminant migration through the McCormick & Baxter Superfund Site sediment cap at levels of concern.

Concentrations from 2010 sampling were compared directly to the concentrations measured in 2009. Locations 5 and 16 show higher concentrations in 2010 compared to 2009, while other locations exhibited similar or lower concentrations in 2010 compared to measurements in 2009. It is unclear at this point as to whether there has been any change at Locations 5 and 16 or whether this simply represents spatial variability in the sampling. It should be emphasized that no concentrations exceeded NWRQC except a single deep sample for chrysene at Location 5. Additional sampling would be required to identify the significance, if any, of the increased concentrations at Location 5.

In summary, the work to-date continues to show that the Site sediment cap remains effective and there is no evidence of significant contaminant breakthrough to the near surface environment.

Bathymetric Surveys and Diver Inspections (2004-2010)

Several bathymetric surveys were conducted during the review period. In order to detect debris or new bathymetric features that could compromise the integrity of the sediment cap, the results of the surveys were used to create differencing images. In 2007, differencing images were created by comparing the bathymetric surveys conducted in 2004, 2005, and 2006. In 2010, differencing images were created by comparing the previous surveys to a survey conducted by NOAA in 2009. The differencing image comparing the 2009 survey with the 2005 survey is shown in Figure V-16.

Diver inspections of deep water areas were conducted to investigate potential unconformities identified by the differencing images. Diver inspections were conducted in 2006, 2007, and 2009. Differencing images and diver inspections led to cap improvements, such as placement of additional rock armor (in 2007) and Organoclay™ RCMs (in 2005 under the BNSF Bridge). The details of the bathymetric surveys and diver inspections are documented in the Annual O&M Reports.

Ebullition and Sheen Investigation Activities (2007-2009)

In late summer of 2005, ebullition-induced sheen was observed, and in 2006, sheen was observed along the shoreline of the Site. In addition, significant ebullition appeared to be associated with areas where bulk organophilic clay was placed.

Ebullition occurs primarily at low river levels (i.e., late summer and fall, and is most prolific during low tide) in the nearshore environment. A schematic of potential contaminant migration pathways as a result of ebullition is presented in Figure V-17. In areas of the sediment cap where bulk organophilic clay was not placed, the gas release periodically has resulted in transport of NAPL to the overlying surface water, resulting in sheen bursts. These areas have been capped with Organoclay™ RCMs (Figure III-2). Based on observations of ebullition where bulk organophilic clay was placed, extensive investigation was conducted to determine whether the organophilic clay was functioning as designed.

Occasional sheens that do not appear to be associated with ebullition are observed along the shoreline of the Site in late summer/early fall. Detailed descriptions of the ebullition and shoreline sheens are provided in the Annual O&M Reports.

As a result of the observations described above, extensive ebullition and sheen investigations were conducted in the past five years. The overarching goal of the ebullition and sheen investigation activities was to determine if the sediment cap remedy is protective, or whether additional remedial measures are required.

Extensive investigations were conducted at the Site in 2008 to determine whether:

- Creosote or PAH contamination is migrating through the sediment cap resulting in a sheen on surface water
- Ebullition is a significant pathway for contaminant transport through the sediment cap
- The Organoclay™ RCMs are performing as designed
- The origin of the gas is from methanogenesis within the bulk organophilic clay layer of the sediment cap
- The bulk organophilic clay is breaking down, and if so, will that adversely affect the longevity of the sediment cap life

Methodology and preliminary results of the 2008 investigation were reported in Appendix G of the 2008 O&M Report and in Appendix F of the 2009 O&M Report. Results are summarized below.

Ebullition Investigation Results

Ebullition Appearance and Rates

During routine monitoring, ebullition (without sheen) appeared to be more prolific in areas where the 1 foot of bulk organophilic clay was placed. Two ebullition surveys were conducted in 2009, which showed that ebullition was clearly more prolific in the areas with bulk organophilic clay. It also showed that in the early summer, ebullition was observed only in areas with organophilic clay while in the early fall, ebullition occurs throughout the sediment cap area remaining most prolific in areas with bulk organophilic clay. The amount of ebullition raised concern whether the gas pathways could be a significant pathway for contaminant transport through the sediment cap and whether the integrity of the bulk organophilic clay could be compromised by the degradation that was assumed to be the origin of the gas formation.

Flux Chamber Results

To address whether the ebullition was a significant contaminant pathway through the sediment cap, gas and water associated with gas pathways were compared to water samples taken adjacent (within a 5 to 10 feet) to gas pathways. Results indicate that the ebullition, although a contaminant pathway, is not a significant pathway for contaminant transport through the sediment cap.

Gas production rate was estimated to be between 2.5 and 5.0 liters per square meter per day (liters/m^2-day) within the bulk organophilic clay footprint and between 0.02 to 0.09 liters/m^2-day in areas of the sediment cap where no bulk organophilic clay is present. Yuan and Reible (2009) report ebullition rates ranging from $3x10^{-4}$ to 2.64 liters/m^2-day because of different site conditions. The ebullition rate outside of the bulk organophilic clay footprint falls within this range. The estimates for ebullition rates over the bulk organophilic clay exceed the high end of the literature range.

PAHs detected for both LPAHs and HPAHs are consistently higher in water from the flux chambers with a gas pathway relative to chambers placed where no gas pathway was observed. The total LPAHs detected in water from the flux chambers placed over gas pathways ranged from 0.089 µg/L to 97.0 µg/L with a median of 1.298 µg/L while the range of total LPAHs in water from the flux chambers, located where no gas pathway was observed, ranged from 0.107 µg/L to 7.05 µg/L with a median of 1.004 µg/L. Total LPAHs by individual locations are 1.2 to 21 times higher in water from the flux chambers located over ebullition pathways than in water from the flux chambers where no gas pathways were observed.

The total HPAHs detected in water from the flux chambers placed over gas pathways ranged from 0.0139 µg/L to 0.137 µg/L with a median of 0.0211 µg/L while the range of total HPAHs in water from the flux chambers, located where no gas pathway was observed, ranged from 0.0071 µg/L to 0.0736 µg/L with a median of 0.0121 µg/L. Total HPAHs by individual locations are 1.5 to 277 times higher than the chamber placed where no gas pathways were observed. Because HPAHs are more likely to be associated with particulate matter via adsorption, this difference in ratios suggests that the gas pathways act more as a pathway for particulate matter than for pore water (where LPAHs are more likely to be present dissolved in water). The cPAH concentrations in water from FC-1G and FC-5G (0.07067 µg/L and 0.0667 µg/L, respectively) exceed the ROD sediment cap performance goal (0.031 µg/L); however, this ambient water quality goal is based on cPAHs dissolved in water, while the above data suggest that the cPAHs may be sorbed to particulate matter. The AWQC that are used as the comparison criteria are based on constituents dissolved in water.

In general, although PAH concentrations were higher in water from the flux chambers located over the top of ebullition pathways, the PAH concentrations detected in water from the flux chambers are generally below comparison criteria.

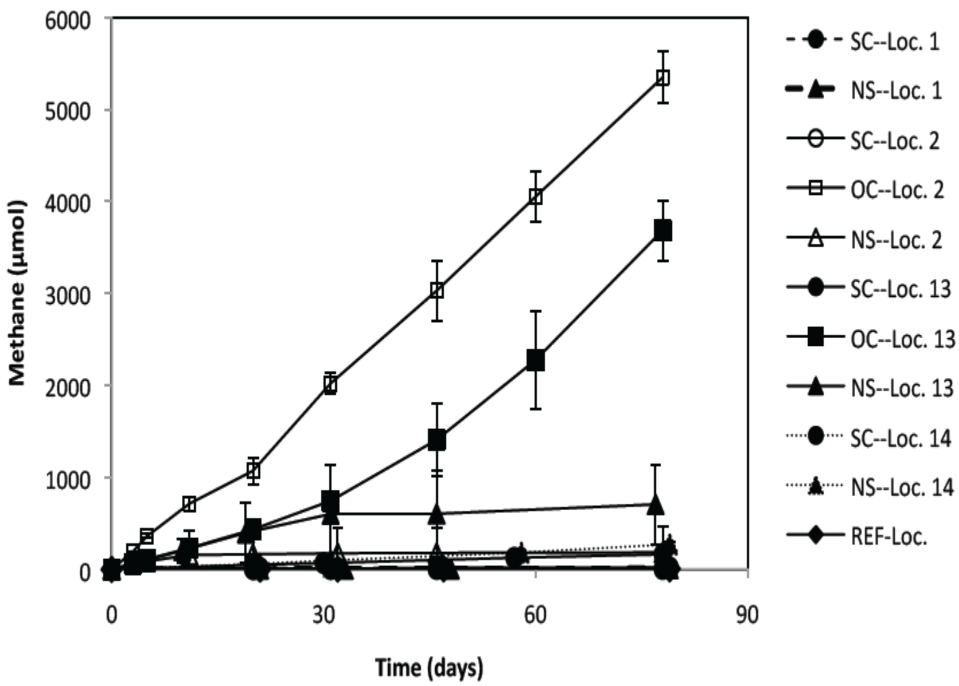
The flux chamber gas sampling showed that methane comprised nearly 100 percent of the gas composition in the areas overlying the bulk organophilic clay while the gas composition in areas without organophilic clay was 9 to 13 percent carbon dioxide and only 36 to 45 percent methane. These results suggest that the primary degradation processes occurring in the bulk organophilic clay is methanogenesis while other processes, such as sulfate reduction, may be occurring in other areas of the sediment cap.

Organophilic Clay Capping Material Evaluation

In 2008-2009, Portland State University (PSU) conducted a study to determine whether the organophilic clay was degrading. The final report is included as Attachment C to Appendix F of the 2009 O&M Report.

Sediment cores and pore water were collected from the sediment cap to investigate microbial activity and the possible causes of methane ebullition from the sediment cap, particularly in areas with bulk organophilic clay. Samples were collected from three sediment cap layers: 1) sediment cap containing a sand layer underlain by a bulk organophilic clay layer; 2) sand layer of the sediment cap where no organophilic clay was present, but within the area where residual creosote was suspected to be present beneath the cap; and 3) a reference location (sand cap layer away from the highly contaminated native sediment and organophilic clay). Pore water samples were collected from the sand cap layer, and below the organophilic clay.

Capping materials (sand and bulk organophilic clay) and native sediment were incubated in the lab to assess the contribution of the layers to overall methane production observed at the Site. Bulk organophilic clay layers of the sediment cap produced up to 1,500 times more methane during an 80-day period than the other layers incubated under the same conditions (see graph below). These results suggested the bulk organophilic clay stimulates methanogenesis (as was suspected by the prolific ebullition in areas where bulk organophilic clay was present).



Methane Production in Incubations (Portland State University).
SC = sediment cap; NS = native sediment; OC = organophilic clay (Aqua Technologies, Inc. – ET-1 from the Site); REF-Loc. = reference location.

Organic Carbon and PAHs in Organophilic Clay

Also in 2008 and 2009, both PSU and UT analyzed the organophilic clays used at the Site for organic carbon to determine whether the bulk organophilic clay is being degraded (i.e., losing carbon). PSU and UT measured the total organic carbon content of fresh organophilic clay and organophilic clay samples retrieved from the Site. A significant loss of total organic carbon was noted in the bulk organophilic clay and less so in the Organoclay™ RCMs. The rates of loss in the bulk organophilic clay were in the same order of magnitude as the molar rates of methane production measured in the incubation tests. This suggests that the carbon originating from the bulk organophilic clay is ultimately converted to methane gas.

From the cores collected in areas with organophilic clay, UT also evaluated the percent of hexane extractable matter (HEM) and PAH concentrations to determine cap protectiveness. The HEM was analyzed to estimate the amount of creosote that the organophilic clay had absorbed since the sediment cap was installed. The findings, however, showed that the HEM percent was not indicative of creosote migrating into the sediment cap; it was more indicative of the organics in fresh organophilic clay and low level dissolved PAH concentrations in pore water and sorbed to the organophilic clay. The HEM percent detected in the organophilic clay is similar to that measured in fresh organophilic clay and likely represents the organic components of the organophilic clay itself. Of particular concern is the potential for biodegradation of the organic components of the organophilic clay.

UT also measured the sorption capacity of the bulk organophilic clay from the cores and found that, although the organic matter responsible for the sorption characteristics of the bulk organophilic clay is degrading, there remains substantial sorption capacity, which is far greater than the amount of NAPL detected at the surface of the sediments in the areas where organophilic clay is present. It is important to note that, because NAPL migration is controlled and contained by the barrier wall, the rate of degradation of the bulk organophilic clay becomes less of a factor in controlling the release of NAPL in areas where organophilic clay is present. Based on analytical data from cores collected from within and beneath the bulk organophilic clay, NAPL is not migrating into the bulk organophilic clay, and thus is not likely to be released. The organophilic clay was not expected to degrade; however, the permeability remains near that of fresh organophilic clay and its sorption capacity remains high, resulting in the conclusion that this portion of the sediment cap is functioning as designed.

Sheen Investigation Results

Sheen Results

In general, sheen is observed along the shoreline in multiple locations along the shoreline near the City of Portland outfall, the upland cap outfall, former TFA, and Willamette Cove areas. The sheen observed at the Site appears as a thin film and is blocky rather than the multi-colored sheen (i.e., rainbow) typically associated with petroleum products. Shoreline sheen samples were collected in 2007, 2008 and 2009 in an effort to identify the potential source, mechanism, and character. The sheen investigations conducted in the summer and fall of 2007 are described in detail in Attachment C of the 2007 O&M Report. No comparison criteria were exceeded during the September 27, 2007, sampling event.

The sheen investigations conducted in the summer and fall of 2008 are described in detail in Appendix G of the 2008 O&M Report. A summary of the results follows.

2008 Sediment Cores and Pore Water Samples

To determine whether contaminants capable of producing a sheen might be migrating through the sediment cap, 33 push probes for sediment sampling, 12 SPME samplers for pore water analysis, and 16 conventional pore water samples using Henry Samplers were collected from areas where sheen has regularly been observed.

Sediment Sampling Results

Thirty-three cores were advanced as follows: along the shoreline in Willamette Cove (10 cores), near the former TFA (21 cores), and at the upgradient end of the Site (2 cores). From these cores, several sediment samples were selected jointly by DEQ and the Hart Crowser/GSI team for laboratory analysis.

Cores were collected, in conjunction with pore water samples, to determine whether the sheen observed along the shoreline was the result of sheen associated with groundwater migrating through the sediment cap. The sediment analytical and field observations are not supportive of contaminated groundwater with sheen migrating through the cap. There was no visual evidence of creosote contamination in the upper portions of the cores and PAH concentrations in sediment were too low to be indicative of creosote migrating through the sediment cap material.

There is a significant reduction (1-2 orders of magnitude) in PAH concentrations between the native contaminated sediment and the sediment cap sand. ROD cleanup goals were not exceeded in any of the sand cap samples demonstrating that the sediment cap is functioning as designed and creosote is not migrating into or through the sediment cap.

The sediment analytical results and field observations were not supportive of contaminant migration through the sediment cap capable of producing a sheen. PAH concentrations in the cap sand material were more than an order of magnitude below the ROD sediment cleanup criteria and were not at concentrations indicative of creosote migrating through the sediment cap.

Pore Water Sampling Results

Pore water was collected from 23 locations co-located with selected core locations. Concentrations of PAHs in the pore water from the cap sand did not exceed the ROD sediment cap performance standards and the risk-based concentrations used for comparison purposes. In addition, the concentrations of PAHs are not indicative of concentrations that would be present in a sheen or present in creosote that could produce a sheen. It appears that groundwater with low level LPAHs is discharging laterally through the cap sand from the upland portion of the Site, and not vertically upward through the sediment cap. Groundwater has been observed discharging from the bank; and no sheen has been observed discharging or migrating with the groundwater. Pore water results are consistent with the results of the surface water, inter-armoring water, and sub-armoring water sampling conducted on a semi-annual basis where periodically concentrations of LPAHs are detected in surface water at greater concentrations than in the inter-armoring or sub-armoring water samples.

SPME Sample Results

UT conducted SPME analyses of pore water in several locations where conventional pore water samples were collected. Concentrations of contaminants were not elevated, suggesting little or no contaminant migration into the upper layers of the cap in these areas. The fact that the SPME-measured pore water concentration of all constituents was effectively uniform indicates that tides or seasonal water level fluctuations had spread contaminants over the entire layer monitored by the SPME (i.e., the layer above the organophilic clay cap materials). In a number of profiles, the lowest concentrations were detected close to the sediment, suggesting that the source of the PAH contaminants was not the sediments (i.e., the source is likely from the lateral groundwater discharge).

The following conclusions were based on the pore water (both conventional and SPME) sample results:

- Low level LPAH concentrations near the surface within the sand portion of the sediment cap are likely the result of lateral groundwater discharge.
- Conventional pore water results collected as part of the ebullition and sheen investigation were consistent with the semi-annual sampling results.
- No connection could be made between contaminants from the native sediment beneath the cap and the observed sheen.
- SPME data showed no evidence of contaminants migrating upward through the sediment cap.

2009 Sheen Characterization and Results

In 2009, the sheen characterization focused on determining the nature of the sheen and included weekly sheen observations, laboratory sheen simulation, and sampling of the sheen using Teflon® pads for both chemical and biological analysis. Montana State University (MSU) conducted the biological analysis. Co-located ambient surface water samples were collected near the sheen sample locations.

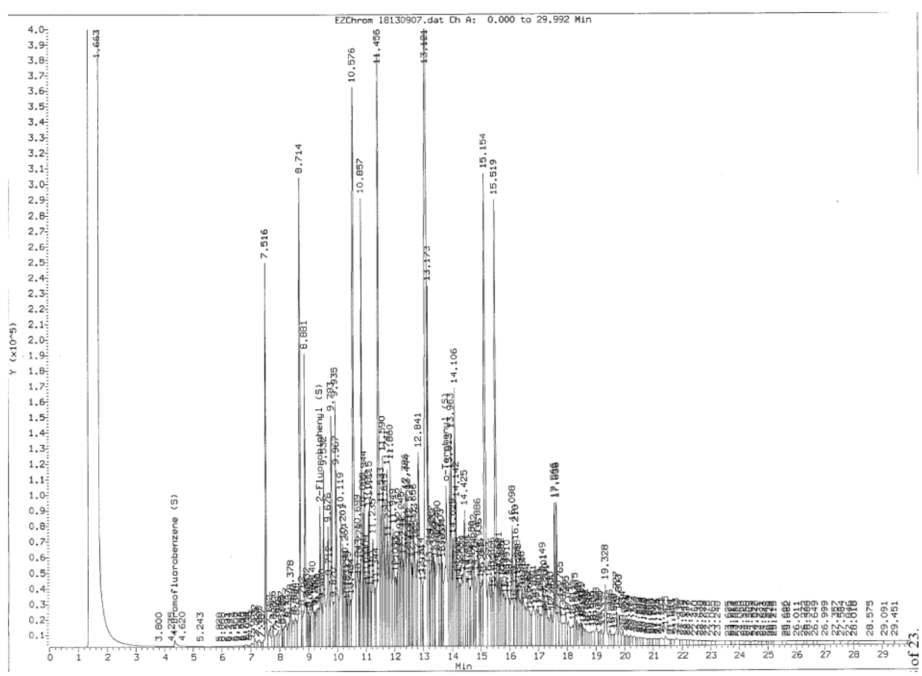
The purpose of the additional 2009 characterization was to identify the nature of the sheen with the objective of understanding whether the sheen presence is related to site contamination, hazardous, or just biogenic or metallic sheen associated with groundwater discharge from the Site.

Sheen Observations

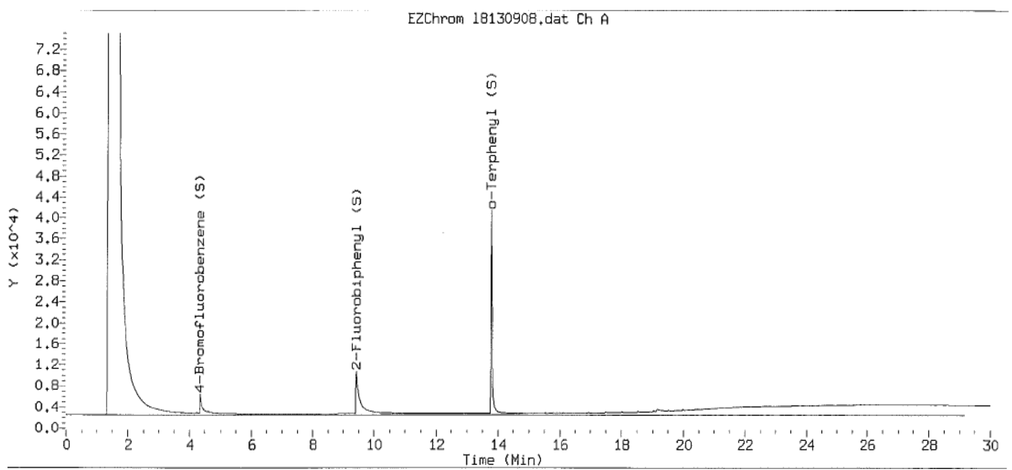
Sheen was consistently (and has been historically) present on warm days when the elevation of the river stage was low. Similar to previous years, the observed sheen was a thin, blocky film that did not re-coalesce upon probing. The sheen's appearance on the sand was a silvery to bronze color with a metallic luster. When the tide came in, the sheen washed away quickly. There were no differences noted in the sheen's appearance or odor between shoreline locations. No ebullition or hydrocarbon-like odor was associated with the sheen.

2009 Analytical Results on Sheen Samples

Sheen of similar thickness to that observed in the field was simulated in the laboratory using recovered NAPL from the Site. The same brand Teflon® nets and pads used to collect sheen in the field were used to collect simulated sheen samples in the laboratory using the same collection procedures. The following figure shows the chromatogram of the simulated sheen.

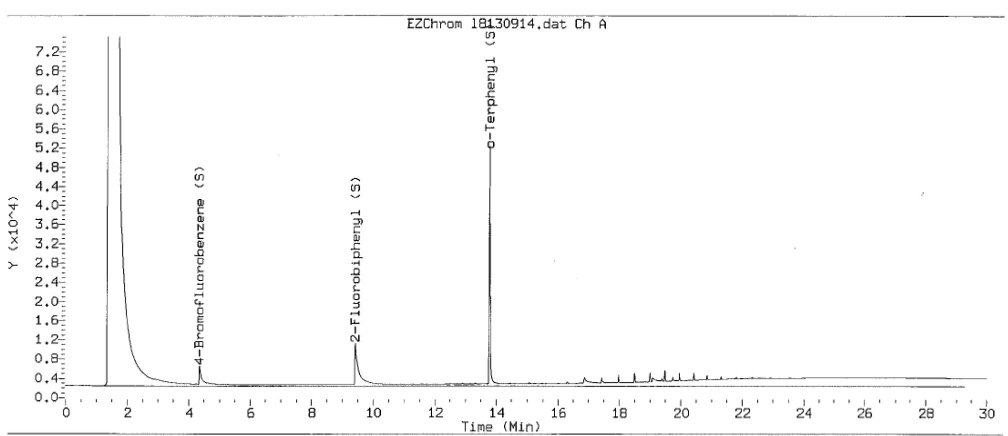


The blank samples for the Teflon® net and pad (i.e. analyzing unused nets and pads) both showed a similar pattern on the chromatogram. The blank Teflon® chromatogram (shown below) shows the chromatogram for the Teflon® net blank.



When comparing the sheen samples to ambient surface water samples, iron was clearly concentrated relative to other metals in the sheen. The ratio of the average mass of iron to manganese in the sheen samples was 54 while the average concentration of iron to manganese in surface water was 9. This indicates a concentration of the iron in the sheen samples relative to the surface water, suggesting that as the stagnant water evaporates, iron is concentrating in the water.

The chromatogram shown below, of the sheen collected in the field, closely resembles the chromatogram for the Teflon® net blank shown above. The chromatograms show no similarity between the sheen samples collected in the field and the simulated sheen sample using Site creosote.



These results provide an additional, strong line of evidence that the sheen is not creosote migrating through the sediment cap. This information is supportive of the 2008 sediment cap pore water and core sample results where no evidence of creosote migration into the sediment cap was observed. The data also strongly suggest that the sheen is related to the higher concentrations of iron present in the sheen samples.

2009 Biological Sheen Characterization

This section describes the results of MSU's sheen characterization and associated surface water to determine whether the sheen was biological in nature. During the weeks ending August 7 and August 14, 2009, surface water and sheen samples were collected using the same technology previously described.

The investigation included culturable microbial counts from sheen samples collected on mesh and parallel water samples, and direct microscopic visualization for evidence of bacterial cells. Particular emphasis was placed on examining samples for bacteria that had morphologies characteristic of iron oxidizing bacteria because prior results (and current data) indicate that the sheen is enriched in iron. An additional characterization of one pair of sheen/mesh and water samples was conducted to compare the overall microbial ecology using polymerase chain reaction (PCR) and DGGE analyses. The microbial ecology describes the types of bacteria and their relationship to their environment (i.e., are they the type of bacteria that would thrive on iron or hydrocarbons).

Although bacteria were present in sheen samples, there is no evidence to support the concept that the sheen is a biofilm or microbial in origin. There was no overall difference in colony types of bacteria cultured from the sheen and parallel water samples. By microscopy, there was no evidence for the presence of iron oxidizing bacteria. A more probable conclusion is that these sheens are composed of metals, particularly iron, based on the elevated concentrations of iron in the sheen.

Willamette Cove ACB Inspection (2010)

An investigation was completed in 2010 to assess the sediment cap integrity in the vicinity of two ACB unconformity locations observed in the Willamette Cove in 2009. The investigation included a historical review of Willamette Cove cap design and construction data, pore water sampling, core collection from the sand cap, and a diver inspection of the unconformity locations. Pore water analytical results were similar to the results of sub-armoring sampling in other areas of the cap. Core sampling confirmed the presence of more than 2 feet of sediment cap in one location, but less than 1 foot of sediment cap in the second location. Analysis of PAHs at the second location indicated that the cap functions as designed, despite the reduced thickness in that area. Additional monitoring of sediment of pore water in these areas where unconformities and reduced sediment cap thickness were observed should be considered for the long-term monitoring plan.

Crayfish Sampling Assessment (2003, 2006, and 2008)

The purpose of the September 2008 crayfish assessment was to provide the Oregon Department of Human Services (DHS) with data to reevaluate a health advisory in effect since July 2, 1991, for commercial harvesting of crayfish in the Willamette River near the Site. The advisory states that "Crayfish taken within 1,000 feet of the property lines of the Site located south of the BNSF Bridge in Portland Harbor should not be eaten" (OHD/ODFW, 1991). This health advisory was issued by DHS as a result of visual observations and limited testing of river sediments in the immediate vicinity of the Site, and the potential for uptake of these contaminants by crayfish. These concerns were confirmed when crayfish samples were collected by DEQ in September 1991 as part of the remedial investigation of the Site (PTI, 1992).

The 1991 and 2003 sampling events occurred before installation of the sediment cap. Results are expressed in terms of 2,3,7,8-TCDD by applying the World Health Organization 2005 mammalian toxic equivalency factors (TEFs) (Van den Berg, et al., 2006) to the individual isomers and calculating a final 2,3,7,8-TCDD TEQ concentration.

Figure V-18 shows a graphical comparison of the whole body 2,3,7,8-TCDD TEQ by area for 2008, 2006, and 2003. 1991 data are not included as they were analyzed only for edible tissue and are not directly comparable. Figure V-18 shows the clear reduction in dioxin/furan concentrations in crayfish between pre-cap data from 2003 and post-cap data from 2006 and 2008 with all post-cap concentrations in crayfish below the Health Advisory Criteria of 0.9 ng/kg. In addition, when compared to the Lower Willamette Group (LWG) Portland Harbor data (Integral et al., 2006; Integral, 2008), where 19 samples of whole body crayfish were collected and analyzed, the McCormick & Baxter Site 2006 and 2008 results are lower. The mean 2,3,7,8-TCDD TEQ concentration for LWG Portland Harbor was 1.58 ng/Kg-wet, which is more comparable to the McCormick & Baxter pre-sediment cap 2003 whole body 2,3,7,8-TCDD TEQ average of 1.1 ng/kg-wet (Integral et al., 2006; Integral, 2008).

Figure V-19 provides a graphical comparison of the 2003, 2006, and 2008 total PAH concentrations in whole body crayfish composites. The 2003 data were reported in dry-weight and were converted on the basis of moisture content to a wet-weight basis for the comparison. Total PAH concentrations ranged from an estimated 3.8 µg/kg-wet to 10.5 µg/kg-wet. CPAHs were estimated in two of the four composite samples at concentrations of 0.31 and 0.35 µg/kg-wet. PCP was not detected in any of the samples. The 2008 PAH results are similar to the 2006 PAH results with the exception of one 2006 outlier collected from the TFA (MBCFGB06-01), which contained elevated concentrations of naphthalene. Both the 2006 and 2008 data results for PAHs are consistently below the 2003 pre-cap concentrations (when converted from dry-weight to wet-weight), with the exception of the 2006 outlier discussed above. 2008 PAH results are lower than the LWG Portland Harbor mean total PAH concentration in crayfish of 71.2 µg/kg-wet; however, of the 36 LWG Portland Harbor samples analyzed for PAHs, only 12 had detectable PAH concentrations (Integral et al., 2006; Integral, 2008).

Crayfish were collected from four areas during the September 2008 sampling event: the former TFA, FWDA, BNSF, and Willamette Cove. There were sufficient crayfish volume to analyze all parameters for whole crayfish composites and, in two areas, there were sufficient crayfish volume to also analyze the edible muscle tissue for PCDD/Fs. Samples were collected to evaluate dioxin/furan concentrations in crayfish as they relate to commercially harvested crayfish adjacent to the Site. Samples were analyzed for dioxin/furans, PAHs, PCP, total metals, and percent lipids. Metal concentrations in crayfish are generally similar to pre-cap concentrations and similar to LWG data for Portland Harbor.

A comparison of whole body crayfish composite samples for total PAHs is shown in Figure V-19. Total PAH concentrations in crayfish from the Site since the sediment cap was emplaced are lower than the mean for LWG Portland Harbor and lower than pre-cap concentrations with the exception of crayfish sampled from the TFA in 2006. Thus, it appears that PAHs in crayfish from the Site also have declined since the sediment cap was constructed.

The Health Advisory was removed on February 25, 2010 (DHS, 2010). Based on the removal of the Health Advisory, no further crayfish sampling is required.

VI. FIVE-YEAR REVIEW PROCESS

ADMINISTRATIVE COMPONENTS

This CERCLA-statutory, Five-Year Review is triggered by the issuance of the ROD and implementation of the groundwater remedial action in 1996. Construction was completed on the soil, sediment, and groundwater components of the remedy in September 2005; however, because of the extensive sampling and assessment activities described in Section VI of this report and the need for a ROD Amendment to address the invalidated ACLs, the O&F determinations for groundwater and the sediment cap OUs have been delayed.

This Third Five-Year Review has been conducted by DEQ and EPA with support from Hart Crowser and GSI. Primary authors and reviewers are Scott Manzano (DEQ project manager), Nancy Harney (EPA project manager), Heidi Blischke (GSI consultant), and Tim Strotzki (Hart Crowser consultant). Members of the Site project team review and comment on draft documents. Every year, DEQ hosts a project team meeting to discuss the status of the remedial actions, provide updates on issues and address project team members' concerns. The annual meeting also includes a Site tour.

Site Inspection

The EPA RPM, EPA Hydrogeologist and DEQ Project Manager inspected the Site on August 5, 2011, as part of the assessment of the protectiveness of the remedy. Examination of the soil cap showed slight borrowing of small animals continues to be something that needs attention. All vegetation is thriving. During the inspection, EPA and DEQ noted that sticks, broken glass, and other garbage were accumulating in the voids of the ACB mats along the shoreline. At the time of the Biological Opinion, NMFS opposed filling the ACB voids with gravel because of concerns about the effects of the gravel on salmon. However, given the accumulation of sharp objects and debris deposited by the river into the ACB voids, EPA and DEQ believe this issue should be revisited. During the inspection, EPA and DEQ confirmed that the engineering controls were in place, current Site use was consistent with the ROD, and physical controls were working as intended except for permanent buoy placement, which was scheduled to be completed (and subsequently was completed) on August 12, 2011.

No other new issues were identified during this inspection.

Community Involvement

Since the Second Five-Year Review there have been limited community involvement activities associated with this Site because all components of the remedy are in place and the main focus of the Site work has been on long-term maintenance and monitoring. Every year, DEQ hosts an annual meeting to discuss sampling and monitoring results with representatives of six Tribes and interested federal and state agencies. Both DEQ and EPA respond to public records requests as well and inquiries through phone calls and e-mails. In general, during the past several years, the number of inquiries from the local community has been very low. An active presence is maintained at the Site and frequent interaction occurs between involved agencies. Therefore, no interviews were specifically scheduled for this review. EPA published a notice in the Oregonian newspaper on August 26, 2011, to inform the public that a Five-Year Review at the McCormick & Baxter Superfund Site was underway. This notice informs the public that there is an opportunity to contact EPA with information or questions. Notice of the availability of this Third Five-Year Review Report will be provided to the community in a press release after the report is issued.

Key documents can be found on the McCormick & Baxter EPA Web site:

> http://yosemite.epa.gov/r10/cleanup.nsf/sites/mccormick_baxter

Document Review

The information reviewed for this report includes the ROD, Amended ROD, ESD, the five annual O&M reports from 2006 – 2010, and the Second Five-Year Review Report. Institution controls for the sediment cap include the Easement granted by the Oregon Department of State Lands, the RNA rule and the permanent buoy permit issued by the USCG, and Oregon Marine Board rules to prohibit anchoring. These documents are included in the references at the end of this Five-Year Review.

Data Review

Extensive sampling, monitoring, investigations, and assessments of the Site were conducted during the past five years and was related to the addressing the outstanding issues and recommendations identified during the Second Five-Year Review. The data and information reviewed are summarized and interpreted as a part of Section V. Data provided in Tables V-2 through V-9 demonstrate that the upland soil cap, the subsurface barrier wall, and the sediment cap work as an integrated system to contain contamination on-site and prevent contaminants from adversely impacting the Willamette River. Further interpretation of these data is carried forward in Section VII.

In October 2009, DEQ observed exposed orange plastic fencing on the ground surface within the BNSF right-of-way, which is located in the northwest part of the Site. During the upland cap construction, approximately 2-foot-thick layer of clean cap material was placed over orange fencing. The orange fencing serves as a way to define the final elevation (sub-grade) and areal extent of potentially contaminated soil remaining beneath the upland soil cap. The orange fencing was visible because part of the upland soil cap had been removed in the right-of-way along with other soil and vegetation. The monument for well MW-61s was damaged during the soil removal activity. The soil and vegetation were being removed by BNSF to prepare that area of the right-of-way for the placement of fill material to construct a road to access the elevated BNSF track located along the northwestern boundary of the property owned by McCormick & Baxter Company**.** Potentially contaminated soil was removed from the right-of-way and hauled to an off-site location.

A License or Access Agreement, completed in March 2005 between DEQ and BNSF, requires BNSF to notify DEQ in the event planned construction or maintenance activities in the right-of-way that could potentially cause damage to the upland soil cap. The terms and conditions of the License were not met because prior notification was not provided to DEQ. BNSF's attention has been brought to this issue through numerous communications with DEQ and EPA, including a Notice of Violation issued by EPA for RCRA violations in February 2010. The License is a contract between DEQ and BNSF that is expected to effectively restrict BNSF's activities in the right-of-way, and serve as an IC for protection of the soil cap. The License does not restrict groundwater use or contain provisions to protect any wells installed for the McCormick & Baxter Site in the BNSF right-of-way. DEQ and EPA plan to complete the required IC for groundwater beneath the BNSF property.

VII. TECHNICAL ASSESSMENT

Because the remedies for the Site's three OUs (soil, sediment, and groundwater) work together, they are discussed together in this section, and the response to each question is based on the Site as a whole.

QUESTION A

IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS? YES.

The soil remedy, sediment remedy, groundwater remedy, and engineering and ICs are functioning as intended by the ROD, as modified by the Amended ROD and the ESD. Section IV summarizes and provides a detailed description of the soil, sediment, and groundwater components of the remedy. This section presents the lines of evidence that demonstrate that the remedy is functioning as intended and meeting the RAOs defined in the ROD and the performance standards defined in the draft O&M Plan.

SOIL REMEDY

The soil remedy was fully implemented in 2005. Highly contaminated soils were removed to a depth of at least 4 feet bgs, and the upland portion of the Site was capped. Long-term monitoring is necessary because soils beneath the cap remain contaminated with arsenic, PCP, PAHs, dioxins, and NAPL. The RAOs and the performance standards for the soil cap are summarized in Section IV.

The soil cap and ICs in place effectively achieve the RAOs to eliminate potential exposures to contaminated soil and minimize the potential for stormwater to infiltrate through contaminated soils to groundwater. Regular inspections and maintenance activities are performed to ensure that the cap continues to function as designed. The following lines of evidence support the determination that the soil cap is functioning as intended:

- The soil cap provides physical separation between contaminated soil and site receptors and effectively eliminates the potential for humans or ecological receptors to be exposed to contaminants. Ongoing inspections (results described in Section V) demonstrate that the soil cap and its associated stormwater conveyance system are intact and functioning as intended.
- Potential exposure is minimized by restricting access to authorized personnel and controlling potential site trespassing with a chain-link security fences and gates. The security fence around the McCormick & Baxter Property is intact and in good repair, and warning signs are in place.
- Long-term access and land use will be controlled through engineering and ICs, including environmental easements to ensure the integrity and protectiveness of the cap are maintained.
- Stormwater runoff is prevented from coming into contact with contaminated soil. Stormwater from the clean impermeable cap is collected and conveyed directly to the Willamette River for discharge. Stormwater from the remaining cap is conveyed via stormwater swales to an on-site vegetated infiltration pond. Groundwater monitoring, downgradient from the pond, demonstrates stormwater infiltration has not resulted in subsurface contaminant mobilization.

O&M annual costs are consistent with original estimates.

Potential O&M issues with the soil remedy are described below:

- A few small areas showed evidence of small animals burrowing into the soil cap. The burrows are repaired and are not believed to have fully penetrated the soil cap, and therefore do not affect protectiveness. The task of soil cap inspection and repair of small animal burrows will be included in future O&M activities.
- A small area of cap subsidence was in a localized area near extraction well EW-1s. The degree of upland soil cap subsidence decreased significantly in 2010 compared to the subsidence measured in 2008 and 2009. The decrease in subsidence is believed to be the result of the placement of an airtight seal on well EW-1s and the stabilization of water levels within the barrier wall. The impermeable cap stormwater drainage system continues to operate effectively following rain events. The subsidence most likely is associated with subsurface degradation of wood chips, and the decrease in groundwater elevation within the barrier wall. The rise in groundwater temperature is also the likely cause of increased DNAPL in EW-1s. The observed subsidence has not affected the effectiveness or protectiveness of the soil cap.

System optimization does not apply to this remedy. Inspection and maintenance of the soil cap is sufficient to maintain its integrity and protectiveness. Inspections were reduced from monthly to quarterly in 2010.

DEQ is in control of the McCormick & Baxter Property at the Site and is prohibiting groundwater use and other unacceptable uses consistent with IC requirements in the ROD. Formal ICs through proprietary restrictions in the form of an EES will be recorded for the McCormick & Baxter Property. These restrictions will prohibit development within the 6-acre riparian zone along the riverbank as required by the Endangered Species Act Biological Opinion issued by the NMFS, prohibit use of Site groundwater as specified by the ROD, and limit disturbance of Site soils. In the event of transfer of any part of the property owned by McCormick & Baxter to a future owner, for DEQ to agree to release its lien on the property, DEQ will require proprietary ICs in the form of an EES to be recorded.

In October 2009, construction activities conducted by the BNSF, disturbed the upland soil cap in the BNSF right-of-way. BNSF failed to notify DEQ of the construction activities as required by the License that provided DEQ access to install the soil cap in the right-of-way. Subsequent actions and communication by DEQ and EPA to BNSF, including a Notice of Violation, reduce the likelihood that this type of failure to comply with the terms of the License will recur.

Sediment Remedy

The sediment remedy was fully implemented in 2005. Twenty three acres of contaminated sediments within the river were capped, and additional armoring and sorptive material (e.g., organophilic clay) were added to supplement the effectiveness of the cap in localized areas. Long-term monitoring and maintenance are necessary because sediments beneath the cap remain contaminated with arsenic, PCP, PAHs, dioxins, and NAPL. The RAOs and performance standards for the sediment cap are summarized in Section IV.

The sediment cap and ICs effectively achieve the RAOs to eliminate potential exposures to contaminated sediment beneath the cap and minimize the potential for contaminants to be released to the Willamette River. Regular inspections and maintenance activities are performed to ensure that the cap continues to function as designed. The following lines of evidence support that the sediment cap is functioning as intended and meeting RAOs and performance standards:

- The sediment cap provides physical separation between contaminated sediment and effectively eliminates potential contaminant exposures to human or ecological receptors. The cap over contaminated sediments in the Willamette River is intact and operating as intended and has survived several high flow events.
- The sediment cap was designed to chemically isolate site contaminants in groundwater discharging through sediments and NAPL. Sediment cap monitoring (i.e., post-cap construction surface, inter-armoring, and sub-armoring water sampling) has been conducted since the sediment cap was completed in 2005 to verify design assumptions and cap effectiveness. Analytical results were compared to AWQCs referenced in the 1996 ROD, as well as current NRWQCs and MCLs established by the EPA. These criteria and recommended values are collectively referred to as comparison criteria. COC concentrations in surface water and inter-armoring water are consistently below comparison criteria, with the exception of arsenic for which the comparison criterion is below the method detection limit for arsenic. COC concentrations in the sub-armoring water are generally below comparison criteria. COC concentration trends are stable or decreasing. Based on water sampling from the surface water, inter-armoring, and sub-armoring, the sediment cap appears to be protective and functioning as designed.
- Visible discharges of NAPL to the river have been effectively eliminated through:
    - The installation of the barrier wall. The barrier wall contains primary NAPL source areas and reduces groundwater migration from upland source areas to the river thereby reducing contaminant flux to the river. No NAPL seeps have been observed since installation of the barrier wall.
    - NAPL extraction from wells located outside the barrier wall, permanently reducing the volume and potential mobility of NAPL.
    - Supplementing the cap by placing Organoclay^{TM} RCMs in ebullition-induced sheen areas and bulk organophilic clay in potential seep areas to minimize the potential for contaminant migration.
- Sediment cap inspections confirmed the cap is intact and stable and did not identify significant indications of any difficulties with the remedy. Minor armoring repairs were conducted in the past five years as described in Section V. It was observed that sand covers a portion of the ACB armoring over some areas of the shoreline, and there are significant amounts of large woody debris that have accumulated to help create wildlife habitat. The sand and woody debris do not affect the protectiveness of the remedy.
- Additional investigations (described in Section V) have been performed to evaluate the effectiveness and overall protectiveness of the cap including:
    - Bulk organophilic clay Core Study
    - DNAPL Investigation
    - Crayfish Sampling Assessment
    - Bathymetric Differencing Images
    - Willamette Cove ACB
    - Ebullition Investigation
    - Sheen Investigations

Annual costs for sediment cap activities are consistent with original estimates.

The only sediment cap issue identified was the reduced sand cap thickness in areas of uneven ACB (unconformities) that were observed in Willamette Cove. This issue was investigated by conducting a historical review of relevant data, a diver inspection survey, and sediment cap coring and pore water sampling within the two observed areas with ACB unconformities. The results of pore water sampling within the sand portion of the sediment cap beneath the unconformities were consistent with the results of sub-armoring sampling in other areas of the sediment cap. Core sampling documents more than 2 feet of sand cap in one location, but less than 1 foot of sand cap in the second location. Analysis of PAHs at the second location indicated that the cap functions as designed. Despite the reduced thickness in that area, the cap remains protective. Additional monitoring of this area, where the sediment cap is thinner than design thickness, is recommended for the long-term monitoring plan.

The ICs include implementing dredging restrictions and notifying USACE and ODSL. Warning buoys are in place to prevent damage to the sediment cap. An RNA in and around the sediment cap pursuant to CFR Title 33, Part 165 was established in March 2009. No additional ICs are warranted on the basis of current conditions.

GROUNDWATER REMEDY

The groundwater remedy consists of NAPL recovery and a subsurface barrier wall surrounding approximately 18 acres within the upland soil cap. The barrier wall was completed in July 2004. Weekly NAPL recovery was conducted throughout 2010. Long-term monitoring is necessary because groundwater both within and outside of the subsurface barrier wall remains contaminated with metals, PCP, PAHs, dioxins, and NAPL. The RAOs and performance standards for the groundwater remedy are summarized in Section IV.

The groundwater remedy and DEQ control of the McCormick & Baxter Property effectively achieve the RAOs to eliminate potential exposures to contaminated groundwater and minimize the potential for groundwater contaminants and NAPL to be released to the Willamette River. Regular inspections and maintenance activities are performed to ensure that the cap continues to function as designed. Based on observations made between 2006 and 2010, the barrier wall, impermeable soil cap, sediment cap, and ICs are functioning in conjunction with one another as intended, and are meeting the goal of minimizing the migration of groundwater contaminants and NAPL into the Willamette River, as follows:

- NAPL recovery efforts have been successful and have permanently reduced the mass, volume and potential mobility of NAPL. The thickness of NAPL is not increasing in any of the monitoring wells inside or outside the barrier wall (with the exception of well EW-1s inside the barrier wall where DNAPL entered the well in the past five years).
    - Presence of creosote along the shoreline has not been observed since construction of the barrier wall was completed.
    - LNAPL was not recovered from any wells at the Site since 2006. Although the thickness of LNAPL varies seasonally with groundwater elevation, the accumulated volume is not increasing, either inside or outside the barrier wall.
    - Approximately 6,500 gallons of NAPL have been extracted from Site wells to date, including 92 gallons recovered from outside the barrier wall in 2010.

- NAPL source areas are contained within the barrier wall and NAPL is prevented from migrating to the Willamette River.
- Shallow groundwater within the barrier wall is isolated from groundwater outside the barrier wall based on the independent groundwater elevations, flow directions, and gradients.
- Groundwater samples, collected from 11 wells in May 2010 were analyzed for total metals, PCP, and PAHs. In general, the 2010 sample results are consistent with historical data, and show either less or similar contaminant concentration compared to the 2006 results.
- Stormwater runoff is prevented from coming into contact with contaminated soil or NAPL source areas and leaching contaminants to groundwater. Stormwater from the clean impermeable cap is collected and conveyed directly to the Willamette River for discharge. Stormwater from the remaining cap is conveyed via stormwater swales to an on-site vegetated infiltration pond.
- Additional investigations (described in Section V) have been performed to evaluate the effectiveness and overall protectiveness of the groundwater remedy including:
    - DNAPL Investigation
    - Ebullition Investigation
    - Sheen Investigations

Annual costs for groundwater remedial activities are consistent with original estimates. No issues have been identified with the groundwater remedy.

DEQ is in control of the McCormick & Baxter Property at the Site and is prohibiting groundwater use and other site uses consistent with IC requirements in the ROD. Contaminated groundwater in the shallow water-bearing zone is not used for human consumption or for any industrial purpose. The fencing around the McCormick & Baxter Property at the Site restricts access to most of the upland capped areas where residual contamination is being managed in place. All access points to the McCormick & Baxter Property are secured with locking gates and signs. In addition, a Site Health and Safety Plan is in place, is properly implemented, and is sufficient to protect site workers from potential site risks during routine Site activities. Groundwater beneath the McCormick & Baxter Property and beneath the property owned by BNSF north of the McCormick & Baxter property will require restrictions to ensure long-term protectiveness consistent with the ROD. DEQ and EPA plan to complete groundwater ICs.

Question B

Are the exposure assumptions, toxicity data, cleanup levels, and Remedial Action Objectives used at the time of the remedy selection still valid? No

The RAOs and cleanup goals for soil and sediment are still valid and are protective of current and anticipated future land use. However, in the Second Five-Year Review, EPA determined that ACLs were not valid as substitutes for MCLs in groundwater at this Site. While ACLs were invalidated, new cleanup levels for groundwater have not yet been formally selected.

Changes in Exposure Pathways

There have been no changes in physical conditions of the Site that would affect the exposure pathways, assumptions, or the protectiveness of the remedy.

Changes in Toxicity and Other Contaminant Characteristics

In 2008, EPA and DEQ updated their human health risk-based screening levels to incorporate the carcinogenic effects for naphthalene. The ROD defines RAOs for total cPAH concentrations to ensure the protection of human health. The cPAH cleanup level for soil was set in the ROD at 1 mg/Kg and for sediment at 2 mg/kg. These concentrations are less than DEQ's 2008 revised risk-based concentrations for naphthalene (4.6 mg/Kg for residential exposure scenarios to 16,000 mg/Kg for excavation worker scenarios). The 2008 revisions also included risk-based screening levels for potential inhalation pathways (i.e., volatilization from soil or groundwater to outdoor or indoor air and groundwater ingestion pathways. The ROD-defined soil cleanup goals are less than the soil inhalation risk-based screening level values (5.5 to 99 mg/kg). Soil and sediment above the ROD-defined cleanup goals have been capped to prevent exposure, as described in Section IV. While groundwater concentrations exceed the revised risk-based concentrations in selected locations, potential exposures to groundwater contaminants via the inhalation pathway are prevented because the soil and sediment caps and ICs effectively eliminate potential human exposure to naphthalene. Therefore, this change does not affect the protectiveness of the remedy.

Changes in Land Use

The majority of the McCormick & Baxter Property is currently vacant and access-controlled by DEQ. In the event of changes in ownership or land use related to the McCormick & Baxter Property, future land and groundwater use will be controlled through an institutional control to ensure the remedy is protective.

New Contaminants and/or Contaminant Sources

No new contaminants and/or contaminant sources have been identified.

Changes in Standards and To-Be-Considereds

The ROD identifies site-specific ACLs for the Site. EPA has determined that ACLs are not valid substitutes for MCLs in groundwater. Based on the data collected and analyzed during the past five years, DEQ and EPA plan to move forward with a ROD Amendment that will establish new groundwater cleanup goals for the Site. DEQ has revised and adopted new water quality criteria for human consumption of fish based on a fish consumption rate that is 10 times higher than the rate used by EPA to develop national AWQC. EPA has not yet approved DEQ's proposed new water quality criteria. However, approval is expected by the end of 2011. These criteria will be addressed in the ROD Amendment along with the selection of new groundwater cleanup goals for the Site.

During meetings in August 2007 between stakeholders (DEQ, EPA, NOAA, Warm Springs Tribe, and Yakama Nation), it was agreed that for comparison purposes, five criteria would be included in analytical results summary tables in the 2008 and subsequent O&M Reports including:

- Two AWQCs in effect at the time the ROD was issued (1996 criteria for chronic effects to aquatic life and for human health based on fish consumption)
- Two 2007 NRWQCs (one for chronic effects to aquatic life and one for human health [consumption of organisms])
- Current MCLs

The above criteria were used as comparison to analyze the data and in general concentrations are less than these criteria. It should be noted that although the above criteria have been included in the O&M Reports for comparison purposes, the 1996 AWQC values are the regulatory criteria for the Site until the ROD is amended.

QUESTION C

HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY? NO.

No new information has come to light that could call into question the protectiveness of the remedy.

TECHNICAL ASSESSMENT SUMMARY

According to the data reviewed and Site inspection results, the remedy is functioning as intended by the ROD, as modified by the Amended ROD and the ESD. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. Two issues that could affect long term protectiveness were identified and are presented in Sections VIII and IX. ARARs for soil contamination cited in the ROD have been met. There have been no changes in the toxicity factors for the COCs that were used in the baseline risk assessment, and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

VIII. ISSUES

Issues	Currently Affects Protectiveness	Affects Future Protectiveness
Need to formally replace the ACLs with revised cleanup goals and identify the associated points of compliance for the groundwater remedy	No	Yes
ICs have not been implemented as required by the ROD for the Site groundwater and soil cap remedies	No	Yes

The following issues do not affect protectiveness, but are expected to require additional follow-up actions:

- ACB Unconformity in Willamette Cove – there is a need to continue to monitor pore water in areas where the sand cap is thinner than the specified design thickness; DEQ will conduct this monitoring in October 2015 in order for the results to be incorporated into the Fourth Five-Year Review.
- NAPL Recovery Termination – additional communication with the Tribes and NOAA is expected or may be needed, if requested, to discuss the findings of the DNAPL Data Gap Investigation Report and then proceed with the implementation of the report recommendations.
- Soil Cap Subsidence – DEQ will conduct quarterly monitoring through December 2015.

- ACB Gravel – DEQ and EPA will contact NMFS to discuss the possibility of filling the ACB voids with gravel to prevent the accumulation of sharp objects and debris.

IX. RECOMMENDATIONS

Issue	Recommendation/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	**Future**
Need to formally replace the ACLs with revised cleanup goals and identify the associated points of compliance for the groundwater remedy.	Prepare a ROD Amendment to replace ACLs with revised cleanup goals and identify associated points of compliance	EPA	EPA	December 31, 2012	No	Yes
ICs have not been implemented as required by the ROD for the Site groundwater and soil cap remedies	Establish and implement an IC Implementation and Assurance Plan	DEQ	DEQ/EPA	December 31, 2012	No	Yes

X. STATEMENT OF PROTECTIVENESS

The Site has achieved Construction Completion and therefore, in accordance with the Five-Year Review Guidance, this section includes a sitewide protectiveness statement in addition to protectiveness statement for each OU at which a remedial action has been initiated.

SOIL OPERABLE UNIT

The remedy for the soil OU is currently protective of human health and the environment because the upland soil cap and engineering controls required by the ROD have been implemented, and are working as intended. However, in order for the remedy to be protective in the long-term, DEQ and EPA need to implement the ICs required by the ROD for the soil cap remedy.

SEDIMENT OPERABLE UNIT

The remedy for the sediment OU is protective of human health and the environment because the remedy required by the ROD has been implemented and is working as intended.

GROUNDWATER OPERABLE UNIT

The remedy for the groundwater OU is currently protective of human health and the environment, because the soil, sediment, and groundwater remedies have been implemented and the RAOs in the ROD have been met. However, the ROD cleanup goals (i.e., ACLs) have been invalidated and ICs have not been implemented, so in order to ensure that the remedy remains protective in the long-term and all ARARs are achieved, a ROD Amendment that establishes new cleanup goals needs to be completed and the ICs required by the ROD for the groundwater remedy need to be implemented.

SITE-WIDE PROTECTIVENESS

The remedies at these operable units are designed to work as an integrated system to meet the RAOs and cleanup goals established for the Site. The remedies for soil, sediment, and groundwater currently are protective of human health and the environment, because the soil and sediment caps, barrier wall, sediment ICs, and engineering controls required by the ROD have been implemented. However, in order for the remedies to be protective of human health and the environment in the long-term, a ROD Amendment that establishes new cleanup goals and points of compliance need to be completed for the groundwater remedy and the ICs required by the ROD for the soil and groundwater remedies need to be implemented.

XI. NEXT FIVE-YEAR REVIEW

The remedy at this Site requires statutory Five-Year Reviews. The next Five-Year Review will be conducted before September 26, 2016.

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TABLES

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Table I-1 - Chronology of Major Site Events

Event	Date
EPA performs a Site inspection which raises concerns about possible releases of hazardous substances.	1983
McCormick & Baxter Creosoting Company performs a preliminary Site investigation and notifies DEQ of possible off-site releases near the former waste disposal area.	1983
McCormick & Baxter Creosoting Company completes Site investigation concluding that soil and groundwater contamination exists at the Site.	1985
DEQ and McCormick & Baxter Creosoting Company sign a Stipulation and Final Order requiring the firm to perform specified remedial activities.	Nov 1987
McCormick & Baxter Creosoting Company files for bankruptcy protection.	Dec 1988
McCormick & Baxter Creosoting Company ceases operations.	Oct 1991
DEQ and EPA complete first Five-Year Review.	Sept 26, 2001
DEQ conducts a Remedial Investigation and Feasibility Study under State cleanup regulations.	1990 to 1992
DEQ conducts Removal Actions, including NAPL extraction, under State of Oregon cleanup regulations.	1992 to 1996
The McCormick & Baxter Creosoting Company Site is added to the NPL.	June 1994
DEQ revises Feasibility Study to comply with CERCLA.	Sept 1995
EPA issues ROD.	Mar 1996
NAPL extraction resumed as a Remedial Action.	Mar 1996
DEQ and EPA entered into a Superfund State Contract.	May 1996
EPA issues Amended ROD specifying off-site disposal of highly contaminated soils.	Mar 1998
Excavation and off-site disposal of highly contaminated soils completed.	Feb to May 1999
EPA issues an ESD for groundwater contingency remedy.	Aug 2002
The subsurface barrier wall is constructed.	Apr to Sept 2003
The sediment cap is constructed.	July 2004 to Sept 2005
The soil cap is constructed.	May to Sept 2005

Event	Date
Pre-final inspection of remedial actions is conducted by DEQ and EPA - Construction Completion is Achieved.	Sept 26, 2005
Preliminary Close Out Report is signed by EPA.	Sept 27, 2005
Operational and Functional (O&F) period begins.	Oct 2005
DEQ and EPA complete second Five-Year Review.	Sept 26, 2006
Draft O&M Plan is approved by EPA (as a Draft Document).	March 2007
Annual O&M Reports.	Annually 2006 - 2010

Table IV-1: Activities Completed Since the Second Five-Year Review
McCormick & Baxter Superfund Site
Portland, OR

Activities and Investigations	Dates and Descriptions
October through December 2006	
Soil and sediment cap inspections	Weekly in October; monthly November and December 2006
Diver inspections of sediment cap armoring	October 2006 diver inspection, and December 2006 embayment probing near TFA
Routine and non-routine maintenance, and vegetation management	October through December 2006
Surface/inter-armor/sub-armor water sampling	October 2006
MW-59s sampling	November 2006
NAPL recovery: exterior wells	EW-2s, EW-9s. EW-10s, EW-19s, MW-20i, MW-34i, MW-Ds, MW-Gs gauged weekly, recovery as criterion was met
NAPL monitoring: interior wells	Site-wide wells gauged November 2006
Groundwater elevation monitoring (Barrier wall performance)	Site-wide wells gauged November 2006; select wells gauged continuously with transducers
Crayfish sampling	October 2006
Temporary buoy placement	October
Organophilic clay cap performance assessment	October 2006 organophilic clay core sampling
2007	
Soil and sediment cap inspections	Monthly; additional weekly sediment cap inspections July through October 2007
Sediment cap multibeam bathymetric and side-scan sonar surveys, diver inspections	Sediment cap armoring assessment and repair: differencing images, June and July 2007 diver inspections, additional rock armor placement
Routine and non-routine maintenance and vegetation management	Semi-annual weed control, summer season irrigation and irrigation system maintenance, periodic plantings, and annual report preparation
Surface/inter-armor/sub-armor water sampling	March and September/October 2007
MW-59s sampling	February and October 2007
NAPL recovery: exterior wells	EW-2s, EW-9s. EW-10s, EW-19s, MW-20i, MW-34i, MW-Ds, MW-Gs gauged weekly, recovery as criterion was met
NAPL monitoring: interior wells	Site-wide wells gauged February, June, September, and December 2007
Groundwater elevation monitoring (Barrier wall performance)	Site-wide wells gauged February, June, September, and December 2007; select wells gauged continuously with transducers
Sheen investigation	June 2007 surface water samples; September 2007 surface water and sub-armoring water samples
Granular organophilic clay and reactive core performance assessment	Laboratory/performance analysis of organophilic clay cores, and reactive core organophilic clay mat collected in 2006
2008	
Soil and sediment cap inspections	Monthly; additional weekly sediment cap inspections July through October 2008
Habitat enhancement features inspection	October 2008
Routine and non-routine maintenance and vegetation management	Semi-annual weed control, summer season irrigation and irrigation system maintenance, periodic plantings, annual report preparation
Surface/inter-armor/sub-armor water sampling	March/April and September 2008
MW-59s sampling	August 2008
NAPL recovery: exterior wells	EW-2s, EW-9s. EW-10s, EW-19s, MW-20i, MW-34i, MW-Ds, MW-Gs gauged weekly, recovery as criterion was met
NAPL monitoring: interior wells	Site-wide wells gauged March, June, September, and December 2008.
Groundwater elevation monitoring (Barrier wall performance)	Site-wide wells gauged March, June, September, and December 2008; select wells gauged continuously with transducers
Soil cap subsidence monitoring	June and August 2008 monitoring well surveys and comparison to 2005 survey; storm drain inspections, October 2008 install transducers at two shallow wells, and reporting
Crayfish sampling	September 2008
Ebullition and sheen investigation	July through October 2008: sheen surveys, sediment (sand cap, organophilic clay, riverbed sediment) cores and organophilic clay mat sampling, porewater sampling, ebullition monitoring and mapping, flux chamber gas and surface water sampling
2009	
Soil and sediment cap inspections	Monthly; additional weekly sediment cap inspections July through October 2009
Habitat enhancement inspection	November 2009
Routine and non-routine maintenance and vegetation management	Semi-annual weed control, summer season irrigation and irrigation system maintenance, periodic plantings, and annual report preparation
Surface/inter-armoring/sub-armoring water sampling	March 2009 by conventional method; October 2009 by conventional method plus co-located solid phase micro-extraction (SPME) sampling at 13 locations
Organophilic clay sampling	Organophilic clay cores collected from Willamette Cove October 2009
MW-59s sampling	August 2009
NAPL recovery: exterior wells	EW-2s, EW-9s. EW-10s, EW-19s, MW-20i, MW-34i, MW-Ds, MW-Gs gauged weekly, recovery as criterion was met
NAPL monitoring and recovery: interior wells	EW-1s gauged weekly starting July 6, 2009, recovery as criterion was met; site-wide wells gauged March, June, September, and December 2009
Groundwater elevation monitoring (Barrier wall performance)	Site-wide wells gauged March, June, September, and December 2009 (December event included 10 additional wells on Triangle Park property); select wells gauged continuously with transducers
Sheen characterization activities	July through August 2009 sheen surveys, August 2009 sheen and surface water sampling, chemical and biological assessment, sheen simulation analysis (Site NAPL comparison)
Soil cap subsidence monitoring	March 2009 storm drain inspection, July 2009 vapor and groundwater sampling at EW-1s, April through September 2009 monthly hub surveys
2010	
Soil and sediment cap inspections	January, February, March, June, August, and December 2010; additional sediment cap inspections July through October 2010
Sediment cap multi-beam bathymetric surveys (2004-2009) data analysis, diver inspections	June 2010: sediment cap differencing images; October 2010 diver inspection
Routine and non-routine maintenance and vegetation management	Semi-annual weed control, irrigation system maintenance, and annual report preparation
Surface/inter-armoring/sub-armoring water sampling	April 2010 by conventional method; October 2010 by SPME
MW-59s sampling	October 2010
NAPL recovery: exterior wells	EW-2s, EW-9s. EW-10s, EW-19s, MW-20i, MW-34i, MW-Ds, MW-Gs gauged weekly, recovery as criterion was met
NAPL monitoring and recovery: interior wells	EW-1s gauged weekly, recovery as criterion was met; site-wide wells gauged June and October 2010.
Groundwater elevation monitoring (Barrier wall performance)	Site-wide wells gauged June and October 2010; select wells gauged continuously with transducers
Groundwater quality assessment	11 wells, Spring 2010.
Willamette Cove ACB inspection	Historical data review, April 2010 porewater sampling, and Fall 2010 sediment coring and diver inspection
January through September 2011	
Soil and sediment cap inspections	March, June, and August 2011
Routine and non-routine maintenance and vegetation management	Semi-annual weed control, vegetation management assessment and plan preparation in August 2011
NAPL recovery: exterior wells	EW-2s, EW-9s. EW-10s, EW-19s, MW-20i, MW-34i, MW-Ds, MW-Gs gauged weekly, recovery as criterion was met; stopped recovery on April 20, 2011; gauged twice in May and monthly thereafter.
NAPL monitoring and recovery: interior wells	EW-1s gauged weekly starting July 6, 2009, recovery as criterion was met; stopped recovery on April 20, 2011; gauged twice in May and monthly thereafter; site-wide wells gauged June 2011.
Groundwater elevation monitoring (Barrier wall performance)	Site-wide wells gauged June 2011; select wells gauged continuously with transducers
DNAPL investigation outside barrier wall	March 2011 four investigative borings near MW-20i; excavation around high-pressure sewer lines

Table IV-2: Sediment Cap Water Quality Comparison Criteria

McCormick & Baxter Superfund Site
Portland, Oregon

Site COCs			1996 AWQCs[1]		2007 NRWQCs[2]		2007 NPDWRs[3]	Summary
			Aquatic Life (chronic)	Human Health (fish consumption only)	Aquatic Life (chronic)	Human Health (consumption of organism only)	MCLs	Minimum of 1996 and 2007 Comparison Criteria
Arsenic		mg/L	0.19		0.15	0.00014	0.01	0.00014
Chromium		mg/L	0.21		0.074		0.1	0.074
Copper		mg/L	0.012		0.009			0.009
Zinc		mg/L	0.11		0.12	26		0.11
Pentachlorophenol		µg/L	13		15	3	1	1
Acenaphthene	L	µg/L	520			990		520
Acenaphthylene	L	µg/L						-
Anthracene	L	µg/L				40000		40000
Benz[a]anthracene	H, C	µg/L				0.018		0.018
Benzo[a]pyrene	H, C	µg/L				0.018	0.2	0.02
Benzo[b]fluoranthene	H, C	µg/L				0.018		0.018
Benzo[g,h,i]perylene	H, C	µg/L						-
Benzo[k]fluoranthene	H	µg/L				0.018		0.018
Chrysene	H, C	µg/L				0.018		0.018
Dibenzo[a,h]anthracene	H, C	µg/L				0.018		0.018
Fluoranthene	H	µg/L		54		140		54
Fluorene	L	µg/L				5300		5300
Indeno[1,2,3-cd]pyrene	H, C	µg/L				0.018		0.018
Naphthalene	L	µg/L	620					620
Phenanthrene	L	µg/L						-
Pyrene	H	µg/L				4000		4000
Total LPAHs		µg/L						-
Total HPAHs		µg/L						-
Total cPAHs		µg/L		0.031				0.031
Total PAHs		µg/L						-

Notes:

Current and superceeded NRWQCs can be found on the EPA website:
http://water.epa.gov/scitech/swguidance/standards/current/index.cfm
Current and superceeded NPDWRs can be found on the EPA website:
http://water.epa.gov/drink/contaminants/index.cfm

[1] AWQCs in effect in 1996, when the ROD was issued.

[2] NRWQCs published as of August 15, 2007 are included for comparison.

[3] NPDWRs published as of August 15, 2007 are included for comparison.

Key:

AWQCs = Aquatic Water Quality Criteria
C = carcinogenic PAH (cPAH)
COC = constituent of concern
H = high molecular weight PAH (HPAH)
L = low molecular weight PAH (LPAH)
MCLs = Maximum Contaminant Levels
mg/L = milligrams per liter
µg/L = micrograms per liter
NPDWRs = National Primary Drinking Water Regulations
NRWQCs = National Recommended Water Quality Criteria
ROD = Record of Decision

Table V-2: Groundwater Analytical Results: MW-59s
McCormick & Baxter Superfund Site
Portland, Oregon

SAMPLE LOCATION		EPA Primary Drinking Water Regulation Maximum Contaminant Levels (for reference only)	MW-59s (2nd Quarter 2006)	MW-59s (4th Quarter 2006)	MW-59s (1st Quarter 2007)	MW-59s (3rd Quarter 2007)	MW-59s (3rd Quarter 2008)	MW-59s (3rd Quarter 2009)	MW-59s (4th Quarter 2010)
Sample Date			**4/26/2006**	**11/3/2006**	**2/28/2007**	**10/3/2007**	**8/21/2008**	**8/31/2009**	**10/7/2010**
Sample Time			**18:01**	**14:47**	**12:00**	**9:58**	**9:50**	**17:19**	**14:52**
Well Depth			**shallow**	**shallow**	**shallow**	**shallow**	**shallow**	**shallow**	**shallow**
CONSTITUENTS OF INTEREST									
Total Metals (mg/L)									
Arsenic		0.01	**0.0080**	**0.0197**	**0.0122**	**0.0225**	**0.0301**	**0.0301**	**0.0302**
Chromium		0.1	**0.0011**	**0.0015**	**0.00319**	**0.00474**	**0.0466**	**0.00073**	**0.00048 J**
Copper		1.3[1]	**0.0005 J**	**0.0011 J**	**0.000520 J**	**0.00107 J**	**0.0584**	**0.0011**	**0.00066**
Iron		NA	NA	NA	NA	NA	NA	**52.6**	NA
Zinc		5[2]	**0.0056**	**0.0075**	**0.00707**	**0.00845**	**0.140**	**0.0102**	**0.0081**
PAHs (mg/L)									
Acenaphthene	L		0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0476 U	0.019 U	0.0032 U
Acenaphthylene	L		0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0476 U	0.019 U	0.0030 U
Anthracene	L		0.0472 U	0.0500 U	0.0495 U	**0.0121 J**	**0.0397**	**0.064**	**0.039 J**
Benz (a) anthracene	H, C		0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0119 U	**0.033**	0.0023 U
Benzo (a) pyrene	H, C	0.2	0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0119 U	0.078 U	0.0030 U
Benzo (b) fluoranthene	H, C		0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0119 U	0.11 U	0.020 U
Benzo (k) fluoranthene	H, C		0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0119 U	**0.021**	0.0039 U
Benzo (ghi) perylene	H, C		0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0119 U	**0.035**	0.0055 U
Chrysene	H, C		0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0119 U	**0.033**	0.0032 U
Dibenzo (a,h) anthracene	H, C		0.0943 U	0.1000 U	0.0990 U	0.0238 U	0.0238 U	0.019 U	0.0076 U
Fluoranthene	H		0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0119 U	**0.041**	**0.031 J**
Fluorene	L		0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0476 U	**0.026**	0.0034 U
Indeno (1,2,3-cd) pyrene	H, C		0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0119 U	0.064 U	0.0062 U
Naphthalene	L		0.0472 U	0.0500 U	0.0495 U	**0.257**	0.0119 U	**0.042 J**	0.0057 U
Pentachlorophenol	L	1	NA	1.0000 U	0.9900 U	0.238 U	0.238 U	NA	NA
Phenanthrene	L		0.0472 U	0.0500 U	0.0495 U	**0.0259**	**0.0357**	**0.085**	**0.048**
Pyrene	H		0.0472 U	0.0500 U	0.0495 U	0.0119 U	0.0119 U	**0.032**	**0.020 J**
Total LPAHs			0.1416 U	0.6500 U	0.6435 U	**0.2950 J**	**0.0754**	**0.217 J**	**0.087 J**
Total HPAHs			0.2596 U	0.2750 U	0.2723 U	0.0655 U	0.0655 U	**0.195**	**0.051 J**
Total cPAHs			0.2124 U	0.2250 U	0.2228 U	0.0536 U	0.0536 U	**0.122**	0.0259 U
Total PAHs			0.4012 U	0.9250 U	0.9158 U	**0.2950 J**	**0.0754**	**0.412 J**	**0.138 J**
FIELD PARAMETERS									
Groundwater Elevation (ft NAVD88)			**17.10**	**12.01**	**16.52**	**23.73**	**14.63**	**13.06**	**22.90**
Temperature (°C)			**14.60**	**14.02**	**10.51**	**14.43**	**15.21**	**17.4**	**14.71**
Oxidation-Reduction Potential (mV)			**-20.00**	**13.60**	**44.7**	**-19.50**	**-15.69**	**-33**	**11.6**
pH			**5.94**	**5.77**	**5.89**	**5.90**	**6.09**	**6.23**	**6.00**
Specific Conductance (mS/cm)			**0.54**	**0.36**	**0.264**	**0.52**	**0.559**	**0.480**	**0.441**
Turbidity (NTU)			**40.80**	**11.60**	**3.42**	**9.15**	**78.70**	NA	NA
Total Suspended Solids (mg/L)			NA	NA	NA	NA	NA	NA	**257**
Dissolved Oxygen (mg/L)			NA	**0.40**	**0.7**	**0.32**	**0.78**	NA	**0.39**

Notes:
bold Indicates the analyte was detected above MDL
bold and shaded Indicates the analyte was detected in excess of MCL
[1]Treatment technique action level
[2]National Secondary Drinking Water Regulation

°C = degrees celsius
C = carcinogenic PAH (cPAH)
H = high molecular weight PAH (HPAH)
J = estimated value
L = low molecular weight PAH (LPAH)

MCL = maximum contaminant level
MDL = method detection limit
µg/L = micrograms per liter
mg/L = milligrams per liter
mS/cm = milliSiemens/centimeter
mV = millivolts
NA = not available
NTU = nephelometric turbidity unit
PAH = polynuclear aromatic hydrocarbon
U = Value Below MDL (value represents MDL)

Table V-3: Spring 2006 and 2010 Groundwater Quality Results
McCormick & Baxter Superfund Site
Portland, Oregon

SAMPLE LOCATION			PW-1d		PW-2d		MW-1r		MW-1r Duplicate[1]		MW-2s		MW-3s		MW-7(wc)		MW-10r[3]		MW-10r Duplicate[4]		MW-15s		MW-17s	
Sample Date			4/25/2006		4/24/2006		5/19/2006		5/19/2006		4/28/2006		5/15/2006		4/25/2006		5/17/2006		5/17/2006		5/19/2006		5/19/2006	
Sample Time			10:42		15:51		9:02		9:02		15:30		16:42		13:17		10:01		10:01		15:36		13:36	
Well Depth			deep		deep		shallow		shallow		shallow		shallow		shallow		shallow		shallow		shallow		shallow	
NAPL (Historically)			--		--		--		--		--		--		--		NAPL		--		NAPL		--	
Inside/Outside Barrier Wall			outside		outside		outside		outside		outside		outside		outside		inside		inside		inside		inside	
CONSTITUENTS OF INTEREST		MCLs																						
Total Metals (mg/L)																								
Arsenic		0.01	0.00216		0.00255		0.000664	U	0.000664	U	0.000664	U	0.00347	J	0.0159		0.0832		0.0831		0.0159		0.00290	
Chromium		0.1	0.00228		0.000810		0.00370		0.00365		0.000472	J	0.000605	U[2]	0.00670		0.00475		0.00427		0.00054	J	0.000121	U
Copper		1.3[9]	0.00154		0.000300	U[2]	0.00528		0.00494		0.00124	U[2]	0.00312	J	0.00249		0.00424		0.00387		0.00201		0.000133	U
Zinc		5[10]	0.00562	U[2]	0.00297	U[2]	0.00449	U[2]	0.00426	U[2]	0.00209		0.00446	J	0.00509	U[2]	0.00737		0.0146		0.00477	U	0.00140	U
Pentachlorophenol (ug/L)		1	0.952	U	0.943	U	0.99	U	1	U	0.943	U	0.98	U	0.962	U	621		573		9.9	U	1	U
Polyaromatic Hydrocarbons (ug/L)																								
Acenaphthene	L		0.0476	U	0.0472	U	0.124		0.367		0.0472	U	0.049	U	0.0481	U	477		412		51.1		0.05	U
Acenaphthylene	L		0.0476	U	0.0472	U	0.0495	U	0.05	U	0.0472	U	0.049	U	0.0481	U	12	U	12.3	U	1.49	U	0.05	U
Anthracene	L		0.0476	U	0.0472	U	0.0502	J	0.14		0.0472	U	0.049	U	0.0481	U	66.1		50.7		3.37		0.107	
Benzo (a) anthracene	H, C		0.0476	U	0.0472	U	0.0495	U	0.0749	J	0.0472	U	0.049	U	0.0481	U	32.8		21.6		0.495	U	0.05	U
Benzo (a) pyrene	H, C	0.2	0.0476	U	0.0472	U	0.0495	U	0.05	U	0.0472	U	0.049	U	0.0481	U	12.6		12.3	U	0.495	U	0.05	U
Benzo (b) fluoranthene	H, C		0.0476	U	0.0472	U	0.0495	U	0.05	U	0.0472	U	0.049	U	0.0481	U	28.2		24.5	U	0.495	U	0.05	U
Benzo (k) fluoranthene	H, C		0.0476	U	0.0472	U	0.0495	U	0.05	U	0.0472	U	0.049	U	0.0481	U	12	U	24.5	U	0.495	U	0.05	U
Benzo (ghi) perylene	H, C		0.0476	U	0.0472	U	0.0495	U	0.05	U	0.0472	U	0.049	U	0.0481	U	12	U	12.3	U	0.495	U	0.05	U
Chrysene	H, C		0.0476	U	0.0472	U	0.0495	U	0.0836	J	0.0472	U	0.049	U	0.0481	U	32		21.2		0.495	U	0.05	U
Dibenzo (a,h) anthracene	H, C		0.0952	U	0.0943	U	0.099	U	0.1	U	0.0943	U	0.098	U	0.0962	U	24	U	24.5	U	0.99	U	0.1	U
Fluoranthene	H		0.0476	U	0.0472	U	0.0796	J	0.323		0.0472	U	0.0495	U	0.0481	U	161		111		3.44		0.129	
Fluorene	L		0.0476	U	0.0472	U	0.2		0.453		0.0472	U	0.0495	U	0.0481	U	251		212		28.8		0.05	U
Indeno (1,2,3-cd) pyrene	H, C		0.0476	U	0.0472	U	0.0495	U	0.05	U	0.0472	U	0.0495	U	0.0481	U	12	U	12.3	U	0.495	U	0.05	U
Napthalene	L		0.0476	U	0.0472	U	0.705		1.53		0.0472	U	0.0887	U[2]	0.0481	U	19100		17000		1440		0.184	
Phenanthrene	L		0.0476	U	0.0472	U	0.151		0.634		0.0472	U	0.0495	U	0.0481	U	386		294		34.2		0.0591	J
Pyrene	H		0.0476	U	0.0472	U	0.0753	J	0.238		0.0472	U	0.0495	U	0.0481	U	114		79.7		1.86		0.0973	J
Total LPAHs			0.143	U	0.142	U	1.23		3.12		0.142	U	0.167	U	0.144	U	20300		18000		1560		0.350	
Total HPAHs			0.262	U	0.260	U	0.155		0.720		0.260	U	0.270	U	0.265	U	381		234		5.30		0.226	
Total cPAHs			0.214	U	0.212	U	0.223	U	0.159		0.212	U	0.221	U	0.216	U	106		42.8		2.23	U	0.225	U
Total PAHs			0.405	U	0.401	U	1.39		3.84		0.401	U	0.438	U	0.409	U	20700		18200		1560		0.576	
FIELD PARAMETERS																								
Temperature (°C)			15.05		16.92		19.34		19.34		15.29		15.57		16.86		23.71		23.71		16.53		15.30	
Oxidation Reduction Potential (mV)			-109		--		168		168		97		-70		-194		-39		-39		-83		209	
pH			6.67		7.3		6.59		6.59		5.8		6.72		6.9		6.51		6.51		7.16		6.69	
Specific Conductance (mS/cm)			0.986		0.805		59.6		59.6		0.364		61.5		0.9		62.5		62.5		53.1		37.0	
Turbidity (NTU)			141		447		37		37		39		2.5		32.6		21		21		5.6		4.7	
Dissolved Oxygen (mg/L)			0.07		0.13		0.3		0.3		6.4		0		0.2		0.3		0.3		0.3		0.6	

Table V-3: Spring 2006 and 2010 Groundwater Quality Results
McCormick & Baxter Superfund Site
Portland, Oregon

SAMPLE LOCATION			MW-18s		MW-20i		MW-22i		MW-23d		MW-32i		MW-34i		MW-35r		MW-35r		MW-36s		MW-36i		MW-36d	
Sample Date			5/22/2006		5/19/2006		5/22/2006		4/27/2006		4/24/2006		5/22/2006		4/25/2006		5/6/2010		5/16/2006		5/12/2006		5/11/2006	
Sample Time			14:22		11:36		12:31		13:15		10:01		13:30		14:35		8:11		15:02		12:46		9:36	
Well Depth			shallow		intermediate		shallow		shallow		shallow		shallow		shallow		shallow		shallow		intermediate		deep	
NAPL (Historically)			--		NAPL		NAPL		--		--		NAPL		--		--		--		--		--	
Inside/Outside Barrier Wall			inside		outside		inside		inside		outside		outside		outside		outside		inside		inside		inside	
CONSTITUENTS OF INTEREST		**MCLs**																						
Total Metals (mg/L)																								
Arsenic		0.01	**0.0220**		**0.00686**		**0.0571**		**0.00307**		**0.0100**		**0.0486**		**0.00104**		**0.00076**		0.00332	U	**0.0553**		**0.0450**	
Chromium		0.1	**0.000121**	**U**	**0.00700**		**0.000990**	**J**	**0.00102**		**0.00503**		**0.000550**	**J**	**0.000860**	**J**	**0.00041**	**J**	**0.0340**		**0.0127**		**0.00222**	
Copper		1.3[9]	**0.000133**	**U**	**0.00221**		**0.00275**		**0.000784**	**J**	0.000820	U[2]	**0.000310**	**J**	0.000480	U[2]	0.00073		**0.00590**	**J**	**0.0115**		**0.000270**	**J**
Zinc		5[10]	0.00249	U[2]	**0.0281**		**0.00981**		**0.00184**	**J**	0.00237	U[2]	0.00438	U[2]	0.00462	U[2]	**0.00250**	**J**	**0.00676**	**J**	**0.0303**		**0.00142**	**J**
Pentachlorophenol (ug/L)		1	0.98	U	**3150**		49	U	0.952	U	0.943	U	**1.09**		0.952	U	**0.52**	**U**	**5.36**		1	U	0.98	U
Polyaromatic Hydrocarbons (ug/L)																								
Acenaphthene	L		**0.829**		**5640**		**357**		**0.264**		0.0472	U	**1.22**		0.0476	U	0.0063	U	0.171	U[2]	**25.7**		**0.529**	
Acenaphthylene	L		0.049	U	95.2	U	**9.22**		0.0476	U	0.0472	U	0.0485	U	0.0476	U	0.0042	U	0.0495	U	0.1	U	0.098	U
Anthracene	L		**0.146**		**1650**		**47**		**0.144**		0.0472	U	**0.13**		0.0476	U	0.0053	U	0.0495	U	0.129	U[2]	0.118	U[2]
Benzo (a) anthracene	H, C		0.049	U	**845**		**18**		0.0476	U	0.0472	U	0.0485	U	0.0476	U	0.0032	U	0.0495	U	0.05	U	0.0735	U[2]
Benzo (a) pyrene	H, C	0.2	0.049	U	**228**		**4.25**	**J**	0.0476	U	0.0472	U	0.0485	U	0.0476	U	0.0032	U	0.0495	U	0.05	U	0.0558	U[2]
Benzo (b) fluoranthene	H, C		0.049	U	**623**		**5.76**		0.0476	U	0.0472	U	0.0485	U	0.0476	U	0.0053	U	0.0495	U	0.05	U	0.0581	U[2]
Benzo (k) fluoranthene	H, C		0.049	U	47.6	U	**5.07**		0.0476	U	0.0472	U	0.0485	U	0.0476	U	0.0053	U	0.0495	U	0.05	U	0.0522	U[2]
Benzo (ghi) perylene	H, C		0.049	U	47.6	U	2.45	U	0.0476	U	0.0472	U	0.0485	U	0.0476	U	0.0021	U	0.0495	U	0.05	U	0.0579	U[2]
Chrysene	H, C		0.049	U	**744**		**14.7**		0.0476	U	0.0472	U	0.0485	U	0.0476	U	**0.0053**	**J**	0.0495	U	0.05	U	0.0748	U[2]
Dibenzo (a,h) anthracene	H, C		0.098	U	95.2	U	4.9	U	0.0952	U	0.0943	U	0.0971	U	0.0952	U		R	0.099	U	0.1	U	0.098	U
Fluoranthene	H		**0.26**		**4340**		**125**		**0.53**		**0.0569**	**J**	**0.13**		0.0476	U	**0.012**	**J**	0.0918	U[2]	0.093	U[2]	**0.0914**	**J**
Fluorene	L		**0.468**		**4670**		**197**		**0.282**		0.0472	U	**0.37**		0.0476	U	0.0032	U	0.0495	U	**0.899**		0.0826	U[2]
Indeno (1,2,3-cd) pyrene	H, C		0.049	U	**52.7**	**J**	2.45	U	0.0476	U	0.0472	U	0.0485	U	0.0476	U	0.0042	U	0.0495	U	0.05	U	0.0495	U[2]
Napthalene	L		**0.211**		**32700**		**9120**		**0.548**		0.0472	U	**5.7**		0.0476	U	**0.02**	**J**	0.0495	U	**1.87**		**1.92**	
Phenanthrene	L		0.049	U	**9490**		**284**		**0.123**		0.0472	U	**0.445**		0.0476	U	**0.0084**	**J**	0.0495	U	0.173	U[2]	0.111	U[2]
Pyrene	H		**0.166**		**2840**		**76.9**		**0.314**		0.0472	U	**0.089**	**J**	0.0476	U	**0.0064**	**J**	0.078	U[2]	0.0743	U[2]	0.0862	U[2]
Total LPAHs			**1.65**		**54200**		**10000**		**1.361**		0.142	U	**7.87**		0.143	U	**0.028**	**J**	0.209	U	**28.5**		**2.45**	
Total HPAHs			**0.426**		**9670**		**252**		**0.844**		0.0569		**0.219**		0.262	U	**0.024**	**J**	0.308	U	0.309	U	**0.0914**	
Total cPAHs			0.221	U	**2490**		**49.7**		0.214	U	0.212	U	0.218	U	0.214	U	**0.0053**	**J**	0.223	U	0.225	U	0.260	U
Total PAHs			**2.08**		**63800**		**10300**		**2.21**		0.199		**8.08**		0.405	U	**0.052**	**J**	0.517	U	**28.8**		**2.54**	
FIELD PARAMETERS																								
Temperature (°C)			**15.49**		--		**15.6**		**15.86**		**16.81**		--		**17.53**		**12.8**		**30.17**		**23.06**		**18.97**	
Oxidation Reduction Potential (mV)			**-65**		--		**-41**		**-214**				--		**-56**		**235**		**129**		**-151**		**-151**	
pH			**7.15**		--		**6.71**		**7.38**		**6.72**		--		**6.57**		**6.47**		**6.19**		**7.53**		**7.79**	
Specific Conductance (mS/cm)			**59.4**		--		**0.117**		**0.752**		**0.9**		--		**0.811**		**0.24**		**41.5**		**72.9**		**76**	
Turbidity (NTU)			**2.6**		--		**14**		**12.8**		**12.1**		--		**20.1**		**12.6**		**29**		**38**		**4.9**	
Dissolved Oxygen (mg/L)			**0.7**		--		**0.7**		**0.04**		**0.09**		--		**0.64**		**12.2**		**1.1**		**1.1**		**1.9**	

Table V-3: Spring 2006 and 2010 Groundwater Quality Results

McCormick & Baxter Superfund Site
Portland, Oregon

SAMPLE LOCATION			MW-37s		MW-37s		MW-37i		MW-37i		MW-37d		MW-37d		MW-38s		MW-38i		MW-38d		MW-39s		MW-39s	
Sample Date			5/8/2006		5/6/2010		5/4/2006		5/6/2010		5/16/2006		5/6/2010		5/16/2006		5/12/2006		5/10/2006		5/8/2006		5/6/2010	
Sample Time			9:26		14:20		16:32		13:35		15:47		13:09		13:21		10:32		16:21		16:45		11:01	
Well Depth			shallow		shallow		intermediate		intermediate		deep		deep		shallow		intermediate		deep		shallow		shallow	
NAPL (Historically)			--		--		--		--		--		--		--		--		--		--		--	
Inside/Outside Barrier Wall			outside		outside		outside		outside		outside		outside		inside		inside		inside		outside		outside	
CONSTITUENTS OF INTEREST		**MCLs**																						
Total Metals (mg/L)																								
Arsenic		0.01	0.00213		0.00550		0.0513		0.03880		0.0353		0.00170		0.0234		0.0224		0.0223		0.0153		0.01210	
Chromium		0.1	0.00252		0.00150		0.00824		0.00240		0.000605	U	0.00024	U	0.0102		0.0320		0.00579		0.0111		0.00140	
Copper		1.3[9]	0.00153	J	0.00120		0.00476		0.00460		0.0105		0.00320		0.00478	J	0.00534	J	0.000570	J	0.00719		0.00170	
Zinc		5[10]	0.00350	U[2]	0.00210	J	0.0114		0.01310		0.00966	J	0.03410		0.00662	J	0.0121		0.00208	U[2]	0.0120		0.00280	J
Pentachlorophenol (ug/L)		1	31.6		158		9.9	U	0.082	U	0.98	U	0.51	U	0.98	U	1	U	18.9	U	1	U	0.54	U
Polyaromatic Hydrocarbons (ug/L)																								
Acenaphthene	L		8.89	J[5]	44.7		0.0495	U	6.6		1.15		0.11		0.153	U[2]	0.0603	U[2]	4.81	J[5]	0.373	J[5]	0.021	J
Acenaphthylene	L		0.25	U	1		0.0495	U	0.039	J	0.049	U	0.004	U	0.049	U	0.05	U	0.943	U	0.0583	J	0.0041	U
Anthracene	L		0.442		0.76		0.0495	U	0.043		0.125	U[2]	0.059		0.101	U[2]	0.05	U	0.943	U	0.246		0.051	
Benzo (a) anthracene	H, C		0.109		0.0031	U	0.0495	U	0.0032	U	0.049	U	0.003	U	0.049	U	0.05	U	0.943	U	0.0927	J	0.0031	U
Benzo (a) pyrene	H, C	0.2	0.0853	J[5]	0.0031	U	0.0495	U	0.0032	U	0.049	U	0.003	U	0.049	U	0.05	U	0.943	U	0.0707	J[5]	0.0031	U
Benzo (b) fluoranthene	H, C		0.111		0.0052	U	0.0495	U	0.0053	U	0.049	U	0.005	U	0.049	U	0.05	U	0.943	U	0.0862	J	0.0051	U
Benzo (k) fluoranthene	H, C		0.107		0.0052	U	0.0495	U	0.0053	U	0.049	U	0.005	U	0.049	U	0.05	U	0.943	U	0.087	J	0.0051	U
Benzo (ghi) perylene	H, C		0.0878	J	0.0021	U	0.0495	U	0.0021	U	0.049	U	0.002	U	0.049	U	0.05	U	0.943	U	0.0586	J	0.002	U
Chrysene	H, C		0.111		0.0031	U	0.0495	U	0.0032	U	0.049	U	0.003	U	0.049	U	0.05	U	0.943	U	0.11		0.0031	U
Dibenzo (a,h) anthracene	H, C		0.1	U		R	0.99	U		R	0.098	U		R	0.098	U	0.1	U	1.89	U	0.1	U		R
Fluoranthene	H		0.257		0.13		0.0495	U	0.011	J	0.049	U	0.004	U	0.113	U[2]	0.0936	U[2]	0.943	U	0.264		0.026	J
Fluorene	L		2.52		18.8		0.0495	U	0.34		0.049	U	0.003	U	0.117	U[2]	0.0617	U[2]	0.943	U	0.29		0.011	J
Indeno (1,2,3-cd) pyrene	H, C		0.0898	J	0.0041	U	0.0495	U	0.0042	U	0.0495	U	0.004	U	0.049	U	0.05	U	0.943	U	0.0575	J	0.0041	U
Napthalene	L		50		406		47.4		0.3		28.2		0.005	U	0.107	U[2]	0.268	U[2]	56.6		0.195		0.0051	U
Phenanthrene	L		1.18		4.4		0.0495	U	0.0033	J	0.049	U	0.006	U	0.118	U[2]	0.0744	U[2]	0.943	U	0.156		0.0061	U
Pyrene	H		0.193		0.1		0.0495	U	0.011	J	0.049	U	0.006	U	0.0857	J	0.0704	U[2]	0.943	U	0.195		0.023	J
Total LPAHs			63.0		476		47.4		7.3		29.35		0.17		0.323		0.282	U	61.4		1.32		0.098	J
Total HPAHs			1.15		0.23		0.718	U	0.022		0.26975	U	0.018	U	0.0857		0.307	U	5.19	U	1.02		0.034	J
Total cPAHs			0.701		0.013	U	0.668	U	0.013	U	0.22075	U	0.013	U	0.221	U	0.225	U	4.25	U	0.563		0.0128	U
Total PAHs			64.2		476		48.1		7.3		29.35		0.17		0.408		0.589	U	66.6		2.34		0.132	
FIELD PARAMETERS																								
Temperature (°C)			21.65		14.6		27.93		14.8		15.9		15.4		24.97		16.87		25.07		21.96		14.2	
Oxidation Reduction Potential (mV)			37		-77		-204		-152		-153		133		-93		-122		-112		-103		-93	
pH			6.72		6.41		6.98		7.15		7.73		6.43		6.82		7.74		7.76		7.03		6.27	
Specific Conductance (mS/cm)			52.3		90.4		1		89.3		82.9		0.35		57.4		58		0.9		77.7		0.87	
Turbidity (NTU)			38		150		55		220		28		11		36		23		36		50		9.9	
Dissolved Oxygen (mg/L)			2.3		5.7		0.16		5		0		0.6		0		2		3.1		1.6		1.8	

Table V-3: Spring 2006 and 2010 Groundwater Quality Results

McCormick & Baxter Superfund Site
Portland, Oregon

SAMPLE LOCATION			MW-39i		MW-39d		MW-39d Duplicate[6]		MW-40s		MW-40i		MW-40d[5]		MW-41s		MW-41s		MW-41i		MW-41d		MW-42s	
Sample Date			5/4/2006		5/3/2006		5/4/2006		5/16/2006		5/12/2006		5/10/2006		5/8/2006		5/6/2010		5/15/2006		5/3/2006		5/16/2006	
Sample Time			14:37		15:25		15:25		10:37		9:12		14:48		13:32		12:08		14:06		13:57		7:42	
Well Depth			intermediate		deep		deep		shallow		intermediate		deep		shallow		shallow		intermediate		deep		shallow	
NAPL (Historically)			--		--		--		--		--		--		--		--		--		--		--	
Inside/Outside Barrier Wall			outside		outside		outside		inside		inside		inside		outside		outside		outside		outside		inside	
CONSTITUENTS OF INTEREST		**MCLs**																						
Total Metals (mg/L)																								
Arsenic		0.01	0.0383		0.0304		0.0378		0.00332	U	0.0104		0.0103		0.00435		0.00250		0.00348	J	0.0132		0.00332	U
Chromium		0.1	0.00211		0.00157		0.00212		0.0154		0.0152		0.00190		0.0246		0.00200		0.00061	U	0.00657		0.03160	
Copper		1.3[9]	0.00262		0.00355		0.00133	J	0.00887	J	0.00387		0.000350	J	0.00746		0.00130		0.00718	J	0.00160	J	0.0150	
Zinc		5[10]	0.00309	U[2]	0.00258	U[2]	0.00205	U[2]	0.0102	J	0.0126		0.00218	U[2]	0.00940		0.00210	J	0.00944	J	0.00223	U[2]	0.0262	
Pentachlorophenol (ug/L)		1	4.22		1	U	3.78		0.98	U	0.99	U	0.943	U	0.99	U	0.53	U	0.99	U	0.962	U	0.98	U
Polyaromatic Hydrocarbons (ug/L)																								
Acenaphthene	L		0.0643	J	4.71		0.0773	J	0.139	U[2]	0.117	U[2]	0.0646	J[5]	0.79	J[5]	0.017		0.0495	U	0.0481	U	0.49	
Acenaphthylene	L		0.05	U	0.1	U	0.05	U	0.049	U	0.0495	U	0.0472	U	0.0697	J	0.0042	U	0.0495	U	0.0481	U	0.049	U
Anthracene	L		0.0635	J	0.274		0.0722	J	0.0645	U[2]	0.0829	U[2]	0.0472	U	0.125		0.059		0.0495	U	0.0572	J	0.14	U[2]
Benzo (a) anthracene	H, C		0.05	U	0.05	U	0.05	U	0.049	U	0.0523	J	0.0472	U	0.0724	J	0.0032	U	0.0495	U	0.0481	U	0.049	U
Benzo (a) pyrene	H, C	0.2	0.05	U	0.05	U	0.05	U	0.049	U	0.0495	U	0.0472	U	0.055	J[5]	0.0032	U	0.0495	U	0.0481	U	0.049	U
Benzo (b) fluoranthene	H, C		0.05	U	0.05	U	0.05	U	0.049	U	0.0502	U[2]	0.0472	U	0.0633	J	0.0053	U	0.0495	U	0.0481	U	0.049	U
Benzo (k) fluoranthene	H, C		0.05	U	0.05	U	0.05	U	0.049	U	0.0495	U	0.0472	U	0.0695	J	0.0053	U	0.0495	U	0.0481	U	0.049	U
Benzo (ghi) perylene	H, C		0.05	U	0.05	U	0.05	U	0.049	U	0.0495	U	0.0472	U	0.0573	J	0.0021	U	0.0495	U	0.0481	U	0.049	U
Chrysene	H, C		0.05	U	0.05	U	0.05	U	0.049	U	0.061	U[2]	0.0472	U	0.0803	J	0.0032	U	0.0495	U	0.0481	U	0.049	U
Dibenzo (a,h) anthracene	H, C		0.1	U	0.1	U	0.1	U	0.098	U	0.099	U	0.0943	U	0.099	U		R	0.099	U	0.0962	U	0.098	U
Fluoranthene	H		0.287		0.0792	J	0.289		0.0535	U[2]	0.113	U[2]	0.0656	J	0.22		0.0082	J	0.0495	U	0.182		0.112	U[2]
Fluorene	L		0.0745	J	0.0528	J	0.0847	J	0.0681	U[2]	0.11	U[2]	0.0637	J	0.436		0.17		0.0495	U	0.0481	U	0.0827	U[2]
Indeno (1,2,3-cd) pyrene	H, C		0.05	U	0.05	U	0.05	U	0.049	U	0.0495	U	0.0472	U	0.056	J	0.0042	U	0.0495	U	0.0481	U	0.049	U
Napthalene	L		0.106		25.9		0.268		0.167	U[2]	0.321	U[2]	0.222		1.76		0.0053	U	0.313	U[2]	0.079	J	0.484	U[2]
Phenanthrene	L		0.0567	J	0.1	U	0.057	J	0.0641	U[2]	0.15	U[2]	0.0472	U	0.228		0.023	J	0.0495	U	0.118		0.135	U[2]
Pyrene	H		0.175		0.05	U	0.181		0.0559	U[2]	0.0995	U[2]	0.0549	J	0.155		0.008	J	0.0495	U	0.106		0.084	U[2]
Total LPAHs			0.365		30.9		0.559		0.276	U	0.415	U	0.350		3.41		0.27	J	0.280	U	0.254		0.490	
Total HPAHs			0.462		0.0792		0.470		0.275	U	0.0523		0.121		0.829		0.016	J	0.272	U	0.288		0.319	U
Total cPAHs			0.225	U	0.225	U	0.225	U	0.221	U	0.0523		0.212	U	0.454		0.013	U	0.223	U	0.216	U	0.221	U
Total PAHs			0.827		31.0		1.03		0.551	U	0.468		0.471		4.24		0.29	J	0.553	U	0.542		0.809	
FIELD PARAMETERS																								
Temperature (°C)			25.08		21.1		25.08		25.43		17.68		20.48		21.79		14.1		18.09		21.9		19.4	
Oxidation Reduction Potential (mV)			-145		-160		-145		6		-101		-128		-6		-32		-97		-149		13	
pH			6.74		7.03		6.74		6.76		7.77		7.83		6.94		6.17		7.72		6.98		6.79	
Specific Conductance (mS/cm)			0.95		0.94		0.95		40.3		49.5		75		68.9		0.69		43.1		0.9		32	
Turbidity (NTU)			29.2		20.5		29.2		60		40		5.6		25		34.7		14		11.6		170	
Dissolved Oxygen (mg/L)			1.6		4.26		1.6		0.3		2.7		1.4		2.9		1		0		0.8		4.2	

Table V-3: Spring 2006 and 2010 Groundwater Quality Results
McCormick & Baxter Superfund Site
Portland, Oregon

SAMPLE LOCATION			MW-42i		MW-42d		MW-43s		MW-43i		MW-43d		MW-44s		MW-44i		MW-44d		MW-45s		MW-45s Duplicate[8]		MW-45i	
Sample Date			5/11/2006		5/10/2006		5/5/2006		5/4/2006		5/3/2006		5/15/2006		5/11/2006		5/10/2006		5/5/2006		5/5/2006		5/18/2006	
Sample Time			15:42		13:21		15:58		11:38		11:20		9:56		11:37		11:16		9:31		9:31		16:48	
Well Depth			intermediate		deep		shallow		intermediate		deep		shallow		intermediate		deep		shallow		intermediate		intermediate	
NAPL (Historically)			--		--		--		--		--		--		--		--		--		--		--	
Inside/Outside Barrier Wall			inside		inside		outside		outside		outside		inside		inside		inside		outside		outside		outside	
CONSTITUENTS OF INTEREST		**MCLs**																						
Total Metals (mg/L)																								
Arsenic		0.01	**0.0349**		**0.0206**		**0.0131**		**0.00360**		**0.00832**		**0.0747**		**0.0492**		**0.00890**		**0.145**		**0.152**		**0.0426**	
Chromium		0.1	**0.00224**		**0.00341**		**0.0635**		**0.0157**		**0.00834**		**0.00356**	**J**	**0.00147**		**0.00396**		**0.00628**		**0.0102**		**0.00424**	
Copper		1.3[9]	**0.00525**		**0.00110**	**J**	**0.0230**		**0.00352**		**0.0114**		**0.00579**	**J**	**0.000564**	**J**	**0.00116**	**J**	**0.0137**		**0.0134**		**0.00096**	**J**
Zinc		5[10]	**0.00970**		0.00281	U[2]	**0.0222**		**0.00661**		**0.0199**		**0.00755**	**J**	**0.00298**	**J**	0.00192	U[2]	**0.0174**		**0.0159**		**0.00207**	**J**
Pentachlorophenol (ug/L)		1	0.98	U	0.943	U	0.943	U	0.98	U	0.99	U	19.8	U	9.8	U	0.952	U	**19.5**		20	U	49.5	U
Polyaromatic Hydrocarbons (ug/L)																								
Acenaphthene	L		**3.54**		**0.116**	**J[5]**	**0.397**		**0.307**		**4.43**		**105**		**227**		**1.6**	**J[5]**	**145**		**122**		**114**	
Acenaphthylene	L		0.049	U	0.0472	U	**0.131**		0.049	U	0.0495	U	1.98	U	24.5	U	0.0476	U	3.88	U	3.00	U	2.48	U
Anthracene	L		0.124	U[2]	**0.149**		**0.575**		**0.134**		**4.62**		**2.23**		**13.3**		**0.448**		**7.69**		**5.83**		2.48	U
Benzo (a) anthracene	H, C		0.0533	U[2]	**0.0683**	**J**	**0.388**		**0.0784**	**J**	**0.892**		0.99	U	0.49	U	**0.0513**	**J**	0.971	U	1.00	U	2.48	U
Benzo (a) pyrene	H, C	0.2	0.0566	U[2]	**0.0728**	**J[5]**	**0.261**		0.049	U	**0.104**		0.99	U	0.49	U	0.0476	U	0.971	U	1.00	U	2.48	U
Benzo (b) fluoranthene	H, C		0.0987	U[2]	**0.162**		**0.402**		0.049	U	**0.295**		0.99	U	0.49	U	0.0476	U	0.971	U	1.00	U	2.48	U
Benzo (k) fluoranthene	H, C		0.0802	U[2]	**0.0832**	**J**	**0.223**		0.049	U	**0.181**		0.99	U	0.49	U	0.0476	U	0.971	U	1.00	U	2.48	U
Benzo (ghi) perylene	H, C		0.0549	U[2]	**0.0629**	**J**	**0.233**		0.049	U	**0.0573**	**J**	0.99	U	0.49	U	0.0476	U	0.971	U	1.00	U	2.48	U
Chrysene	H, C		0.101	U[2]	**0.126**		**0.561**		**0.0888**	**J**	**1.02**		0.99	U	0.49	U	**0.0555**	**J**	0.971	U	1.00	U	2.48	U
Dibenzo (a,h) anthracene	H, C		0.098	U	0.0943	U	**0.114**		0.098	U	0.099	U	1.98	U	0.98	U	0.0952	U	1.94	U	2.00	U	4.95	U
Fluoranthene	H		0.225	U[2]	**0.328**		**2.07**		**4.32**		**15.5**		**1.32**	**J**	**14**		**0.695**		**6.47**		**5.05**		2.48	U
Fluorene	L		0.0712	U[2]	**0.0844**	**J**	**0.368**		**0.164**		**1.8**		**44.5**		**125**		**1.6**		**74.5**		**60.4**		**24.3**	
Indeno (1,2,3-cd) pyrene	H, C		0.0565	U[2]	**0.0623**	**J**	**0.211**		0.049	U	**0.0628**	**J**	0.99	U	0.49	U	0.0476	U	0.971	U	1.00	U	2.48	U
Napthalene	L		1.45	U[2]	**0.711**		**1.08**		**3.12**		**0.23**		**1280**		**4420**		**1.77**		**5450**		**4550**		**724**	
Phenanthrene	L		0.0952	U[2]	**0.156**		**0.574**		**0.197**		**29.1**		**21.6**		**141**		**3.82**		**58.6**		**45.5**		**7.31**	
Pyrene	H		0.146	U[2]	**0.236**		**1.28**		**2.06**		**6.92**		0.99	U	**6.6**		**0.333**		**3.35**		**2.68**		2.48	U
Total LPAHs			**3.54**		**1.22**		**3.13**		**3.92**		**40.2**		**1450**		**4930**		**9.24**		**5740**		**4780**		**870**	
Total HPAHs			0.485	U	**1.20**		**5.74**		**6.55**		**25.0**		**1.32**		**20.6**		**1.13**		**9.82**		**7.73**		13.6	U
Total cPAHs			0.300	U	**0.638**		**2.39**		**0.167**		**2.61**		4.46	U	2.21	U	**0.107**		4.37	U	4.50	U	11.2	U
Total PAHs			4.03	U	**2.42**		**8.87**		**10.5**		**65.2**		**1450**		**4950**		**10.4**		**5750**		**4790**		**870**	
FIELD PARAMETERS																								
Temperature (°C)			17.02		22.81		17.45		26.47		19.47		22.2		18.55		20.63		19.23		19.23		25.81	
Oxidation Reduction Potential (mV)			-123		-107		114		-61		-39		-67		-84		-137		30		30		-113	
pH			7.37		7.45		5.86		6.74		6.88		6.79		6.86		7.83		5.85		5.85		6.85	
Specific Conductance (mS/cm)			103		0.239		0.9		0.9		0.848		53.1		94.7		47.2		0.869		0.869		62.7	
Turbidity (NTU)			60		6.9		30		56.6		341		30		4.6		11		6.8		6.8		7.9	
Dissolved Oxygen (mg/L)			0.07		1.7		0.16		2.88		0.09		1.5		1.1		1.8		0		0		0	

Table V-3: Spring 2006 and 2010 Groundwater Quality Results
McCormick & Baxter Superfund Site
Portland, Oregon

SAMPLE LOCATION			MW-45d		MW-46s		MW-47s		MW-47s		MW-48s		MW-49s		MW-50s		MW-51s		MW-52s		MW-53s		MW-53s	
Sample Date			5/2/2006		4/27/2006		4/27/2006		5/6/2010		5/2/2006		5/18/2006		5/2/2006		4/26/2006		5/1/2006		4/26/2006		5/6/2010	
Sample Time			16:28		11:07		9:42		12:20		12:17		14:21		9:47		12:17		16:35		10:25		10:10	
Well Depth			deep		shallow		shallow		shallow		shallow		shallow		shallow		shallow		shallow		shallow		shallow	
NAPL (Historically)			--		--		--		--		--		--		--		--		--		--		--	
Inside/Outside Barrier Wall			outside		inside		outside		outside		inside		outside		inside		outside		inside		outside		outside	
CONSTITUENTS OF INTEREST		**MCLs**																						
Total Metals (mg/L)																								
Arsenic		0.01	0.0122		0.00891		0.0135		0.01070		0.00633		0.00276		0.00307		0.000940	J	0.00394		0.0132		0.01810	
Chromium		0.1	0.00327		0.00116		0.00106		0.00150		0.00164		0.000870	J	0.000359	J	0.000890	J	0.00347		0.00102		0.00120	
Copper		1.3[9]	0.00201		0.000312	J	0.000212	J	0.00180		0.00300		0.00101	J	0.00582		0.000800	U[2]	0.00653		0.00125	J	0.00710	
Zinc		5[10]	0.00253	U[2]	0.00145	J	0.00186	J	0.00480	J	0.00501		0.00241	J	0.00639		0.00413	U[2]	0.0141		0.00688		0.01030	
Pentachlorophenol (ug/L)		1	0.971	U	0.943	U	0.962	U	0.53	U	1	U	0.99	U	0.98	U	0.952	U	4.92	J	1650		68.4	
Polyaromatic Hydrocarbons (ug/L)																								
Acenaphthene	L		1.16		0.884		1.95		2.1		0.388		25.9		6.93		4.91		0.0495	U	0.0472	U	0.011	J
Acenaphthylene	L		0.0485	U	0.0472	U	0.0481	U	0.0043	U	0.05	U	0.22		0.049	U	0.0476	U	0.0495	U	0.0472	U	0.0041	U
Anthracene	L		0.0495	J	0.0548		0.0632	J	0.023	J	0.152		0.237		0.148		0.104		0.0901	J	0.474		0.16	
Benzo (a) anthracene	H, C		0.0485	U	0.0472	U	0.0481	U	0.0032	U	0.05	U	0.0495	U	0.049	U	0.0476	U	0.0495	U	0.0472	U	0.0031	U
Benzo (a) pyrene	H, C	0.2	0.0485	U	0.0472	U	0.0481	U	0.0032	U	0.05	U	0.0495	U	0.049	U	0.0476	U	0.0495	U	0.0472	U	0.0031	U
Benzo (b) fluoranthene	H, C		0.0485	U	0.0472	U	0.0481	U	0.0054	U	0.05	U	0.0495	U	0.049	U	0.0476	U	0.0495	U	0.0472	U	0.0051	U
Benzo (k) fluoranthene	H, C		0.0485	U	0.0472	U	0.0481	U	0.0054	U	0.05	U	0.0495	U	0.049	U	0.0476	U	0.0495	U	0.0472	U	0.0051	U
Benzo (ghi) perylene	H, C		0.0485	U	0.0472	U	0.0481	U	0.0022	U	0.05	U	0.0495	U	0.049	U	0.0476	U	0.0495	U	0.0472	U	0.0021	U
Chrysene	H, C		0.0485	U	0.0472	U	0.0481	U	0.0032	U	0.05	U	0.0495	U	0.049	U	0.0476	U	0.0495	U	0.0472	U	0.0031	U
Dibenzo (a,h) anthracene	H, C		0.0971	U	0.0943	U	0.0962	U		R	0.1	U	0.099	U	0.098	U	0.0952	U	0.099	U	0.0943	U		R
Fluoranthene	H		0.0621	J	0.0603	J	0.0487	J	0.018	J	0.05	U	0.0495	U	0.049	U	0.0476	U	0.0801	J	0.0472	U	0.011	J
Fluorene	L		0.576		0.0472	U	0.0868	J	0.0032	U	0.0558	J	6.51		0.0517	J	0.0476	U	0.0495	U	0.0472	U	0.017	J
Indeno (1,2,3-cd) pyrene	H, C		0.0485	U	0.0472	U	0.0481	U	0.0043	U	0.05	U	0.0495	U	0.049	U	0.0476	U	0.0495	U	0.0472	U	0.0041	U
Napthalene	L		0.284		0.0472	U	0.0481	U	0.0054	U	16.6		23.2		0.049	U	0.0476	U	0.0495	U	0.0472	U	0.45	
Phenanthrene	L		0.385		0.0472	U	0.131		0.048		0.05	U	0.165		0.0786	J	0.0476	U	0.0495	U	0.0472	U	0.019	J
Pyrene	H		0.0485	U	0.0484	J	0.0481	U	0.014	J	0.05	U	0.0495	U	0.049	U	0.0476	U	0.0612	J	0.0933	J	0.014	J
Total LPAHs			2.45		0.939		2.23		2.2	J	17.2		56.2		7.21		5.01		0.0901		0.474		0.66	J
Total HPAHs			0.0621		0.109		0.0487		0.032	J	0.275	U	0.272	U	0.270	U	0.262	U	0.141		0.0933		0.025	J
Total cPAHs			0.218	U	0.212	U	0.216	U	0.013	U	0.225	U	0.223	U	0.221	U	0.214	U	0.223	U	0.212	U	0.013	U
Total PAHs			2.52		1.05		2.28		2.2	J	17.5		56.2		7.48		5.28		0.231		0.567		0.68	J
FIELD PARAMETERS																								
Temperature (°C)			22.09		18.12		17.35		13.7		18.06		18.9		19.21		16.09		17.93		17.03		12.8	
Oxidation Reduction Potential (mV)			-162		-61		-13		-70		-33		-26		-39		-6		96		-115		-118	
pH			6.79		5.57		5.9		6		6		6.44		6.26		6.34		5.92		6.41		6.34	
Specific Conductance (mS/cm)			0.822		0.99		0.9		0.09		0.999		51.6		0.9		0.928		0.815		0.9		0.73	
Turbidity (NTU)			29		7		0		170		10.3		1.6		0		30		237		35.2		26	
Dissolved Oxygen (mg/L)			0.21		0.03		0.01		5.2		0.05		0.1		0.1		0.18		0.23		0.09		0.4	

Table V-3: Spring 2006 and 2010 Groundwater Quality Results
McCormick & Baxter Superfund Site
Portland, Oregon

SAMPLE LOCATION			MW-54s		MW-55s		MW-55s		MW-56s[3]		MW-57s		MW-58s		MW-58s		MW-58i		MW-58d		MW-59s		MW-60d	
Sample Date			5/1/2006		4/26/2006		5/6/2010		5/17/2006		5/9/2006		5/9/2006		5/6/2010		5/18/2006		4/27/2006		4/26/2006		5/9/2006	
Sample Time			15:13		9:02		9:10		11:04		17:06		13:56		10:36		9:41		16:55		18:01		11:07	
Well Depth			shallow		shallow		shallow		shallow		shallow		shallow		shallow		intermediate		deep		shallow		deep	
NAPL (Historically)			--		--		--		NAPL		--		--		--		--		--		--		--	
Inside/Outside Barrier Wall			inside		outside		outside		inside		outside		outside		outside		outside		outside		outside		outside	
CONSTITUENTS OF INTEREST		**MCLs**																						
Total Metals (mg/L)																								
Arsenic		0.01	0.000664	U	0.00547		0.00180		0.0210		0.00762		0.00309		0.00062		0.0453		0.00696		0.00803		0.0269	
Chromium		0.1	0.00157		0.000480		0.00086		0.000560	J	0.00994		0.00347		0.00110		0.0220		0.00310		0.00109		0.00844	
Copper		1.3[9]	0.00213		0.000580	U[2]	0.00210		0.000740	J	0.0102		0.00343		0.00230		0.0155		0.000599	J	0.000503	J	0.00139	J
Zinc		5[10]	0.0144		0.00751		0.00600		0.00522		0.0336		0.00368	U[2]	0.00290	J	0.0277		0.00192	J	0.00556		0.00273	U[2]
Pentachlorophenol (ug/L)		1	0.962	U	0.952	U	0.51	U	928		192	U	0.952	U	0.56	U	0.99	U	0.952	U	0.943	U	9.71	U
Polyaromatic Hydrocarbons (ug/L)																								
Acenaphthene	L		0.0728	J	0.0476	U	0.0061	U	507		147	J[5]	0.325	J[5]	0.0065	U	2.26		0.0476	U	0.0472	U	89.5	J[5]
Acenaphthylene	L		0.0481	U	0.0476	U	0.0041	U	12.1		9.62	U	0.0476	U	0.0043	U	0.0495	U	0.0476	U	0.0472	U	0.971	U
Anthracene	L		0.0693	J	0.146		0.022	J	71.7		9.62	U	0.0499	J	0.0084	J	0.514		0.0476	U	0.0472	U	2.41	
Benzo (a) anthracene	H, C		0.0481	U	0.0476	U	0.0031	U	23		9.62	U	0.0476	U	0.0033	U	0.46		0.0476	U	0.0472	U	0.485	U
Benzo (a) pyrene	H, C	0.2	0.0481	U	0.0476	U	0.0031	U	11.9	U	9.62	U	0.0476	U	0.0033	U	0.133		0.0476	U	0.0472	U	0.485	U
Benzo (b) fluoranthene	H, C		0.0481	U	0.0476	U	0.0051	U	11.9	U	9.62	U	0.0476	U	0.0054	U	0.178		0.0476	U	0.0472	U	0.485	U
Benzo (k) fluoranthene	H, C		0.0481	U	0.0476	U	0.0051	U	11.9	U	9.62	U	0.0476	U	0.0054	U	0.157		0.0476	U	0.0472	U	0.485	U
Benzo (ghi) perylene	H, C		0.0481	U	0.0476	U	0.002	U	11.9	U	9.62	U	0.0476	U	0.0022	U	0.0495	U	0.0476	U	0.0472	U	0.485	U
Chrysene	H, C		0.0481	U	0.0476	U	0.0031	U	21		9.62	U	0.0476	U	0.0033	U	0.385		0.0476	U	0.0472	U	0.485	U
Dibenzo (a,h) anthracene	H, C		0.0962	U	0.0952	U		R	23.8	U	19.2	U	0.0952	U		R	0.099	U	0.0952	U	0.0943	U	0.971	U
Fluoranthene	H		0.112		0.0476	U	0.013	J	181		14.4	J	0.0697	J	0.0043	U	2.49		0.0476	U	0.0472	U	5.93	
Fluorene	L		0.0977		0.0476	U	0.0034	J	282		69.9		0.182		0.0057	J	2.06		0.0476	U	0.0472	U	22.1	
Indeno (1,2,3-cd) pyrene	H, C		0.0481	U	0.0476	U	0.0041	U	11.9	U	9.62	U	0.0476	U	0.0043	U	0.0495	U	0.0476	U	0.0472	U	0.485	U
Napthalene	L		0.0481	U	0.0476	U	0.0051	U	12800		1600		1.31		0.0054	U	4.57		0.0476	U	0.0472	U	3870	
Phenanthrene	L		0.179		0.0476	U	0.0099	J	505		66.5		0.0683	J	0.0065	U	4.75		0.0476	U	0.0472	U	16.3	
Pyrene	H		0.0677	J	0.0476	U	0.0092	J	114		9.62	U	0.0797	J	0.0065	U	1.55		0.0476	U	0.0472	U	3.15	
Total LPAHs			0.419		0.146		0.035	J	14200		1880		1.94		0.014	J	14.2		0.143	U	0.142	U	4000	
Total HPAHs			0.180		0.262	U	0.022	J	339		14.4		0.149		0.019	U	5.35		0.262	U	0.260	U	13.4	
Total cPAHs			0.216	U	0.214	U	0.013	U	44.0		43.3	U	0.214	U	0.014	U	1.31		0.214	U	0.212	U	2.18	U
Total PAHs			0.599		0.408		0.058	J	14500		1890		2.08		0.014	J	19.5		0.405	U	0.401	U	4010	
FIELD PARAMETERS																								
Temperature (°C)			19.98		16.56		12		--		21.31		20.77		12.6		19.4		22.83		14.6		17.76	
Oxidation Reduction Potential (mV)			138		-100		135		--		-54		-52		96		-148		-178		-20		-135	
pH			4.93		6.39		5.49		--		6.92		7.23		6.23		7.6		7.32		5.94		7.58	
Specific Conductance (mS/cm)			0.407		0.883		0.23		--		57.2		30.3		40.8		56.3		0.999		0.54		82.2	
Turbidity (NTU)			263		13.5		14.9		--		65		12		58		250		45.5		40.8		14	
Dissolved Oxygen (mg/L)			0.51		0.06		0.6		--		1.3		2.6		7.4		0		0.7		0		1.5	

Table V-3: Spring 2006 and 2010 Groundwater Quality Results
McCormick & Baxter Superfund Site
Portland, Oregon

SAMPLE LOCATION			MW-61s		MW-62i		MW-As		MW-Ds[7]		MW-Gs		MW-Ks		MW-As		EW-1s[3,7]		EW-2s		EW-8s		EW-9s	
Sample Date			4/25/2006		5/10/2006		5/18/2006		5/18/2006		5/19/2006		4/28/2006		5/18/2006		5/17/2006		5/19/2006		5/22/2006		5/18/2006	
Sample Time			16:43		9:22		11:41		11:57		13:42		16:50		11:41		14:23		8:45		10:01		15:30	
Well Depth			shallow		intermediate		shallow		shallow		shallow		shallow		shallow		shallow		shallow		shallow		shallow	
NAPL (Historically)			--		--		--		NAPL		NAPL		--		--		NAPL		NAPL		NAPL		NAPL	
Inside/Outside Barrier Wall			outside		inside		outside		outside		outside		outside		outside		inside		outside		inside		inside	
CONSTITUENTS OF INTEREST		**MCLs**																						
Total Metals (mg/L)																								
Arsenic		0.01	0.000664	U	0.0376		0.00589		2.71		0.0244		0.00495		0.00318		0.0145		0.00110		0.00854		0.0402	
Chromium		0.1	0.00138		0.00111		0.00159		212		0.00236		0.00127		0.00031	J	0.00012	U	0.0149		0.000400	J	0.000121	U
Copper		1.3[9]	0.000660	U[2]	0.00083	U[2]	0.00206		5.10		0.00796		0.00924		0.00181	J	0.000150	J	0.00410		0.000133	U	0.000890	J
Zinc		5[10]	0.00653	U[2]	0.00383	J	0.00254	J	2.21		0.0422		0.151		0.12300		0.0101		0.00388	U	0.00364	U[2]	0.000620	J
Pentachlorophenol (ug/L)		1	0.962	U	0.962	U	0.971	U	240000	U	2730		0.943	U	0.952	U	952	U	562		20.8	U	95.2	U
Polyaromatic Hydrocarbons (ug/L)																								
Acenaphthene	L		0.0481	U	121	J[5]	0.206		494000		952		0.0472	U	0.0476	U	9200		245		500		327	
Acenaphthylene	L		0.0481	U	0.962	U	0.0485	U	12000	U	19	U	0.0472	U	0.0476	U	99.6		23.8	U	12.1		4.76	U
Anthracene	L		0.0481	U	0.427		0.0617	J	166000		230		0.0472	U	0.0476	U	2150		68.1		14.7		34.5	
Benzo (a) anthracene	H, C		0.0481	U	0.0481	U	0.0669	J	98900		112		0.0472	U	0.0476	U	1850		49.6		5.78		11.3	
Benzo (a) pyrene	H, C	0.2	0.0481	U	0.0481	U	0.0485	U	27400		28.5		0.0472	U	0.0476	U	532		23.8	U	1.29	J	4.76	U
Benzo (b) fluoranthene	H, C		0.0481	U	0.0481	U	0.0485	U	91900		78.6		0.0472	U	0.0476	U	752		63.4		2.05	J	10.4	
Benzo (k) fluoranthene	H, C		0.0481	U	0.0481	U	0.0485	U	12000	U	4.76	U	0.0472	U	0.0476	U	648		23.8	U	1.42	J	4.76	U
Benzo (ghi) perylene	H, C		0.0481	U	0.0481	U	0.0485	U	12000	U	5.79	J	0.0472	U	0.0476	U	104		23.8	U	1.04	U	4.76	U
Chrysene	H, C		0.0481	U	0.0481	U	0.0632	J	91500		97.6		0.0472	U	0.0476	U	1530		50.6		4.01		11.1	
Dibenzo (a,h) anthracene	H, C		0.0962	U	0.0962	U	0.0971	U	24000	U	9.52	U	0.0943	U	0.0952	U	95.2	U	47.6	U	2.08	U	9.52	U
Fluoranthene	H		0.0481	U	0.163		0.266		440000		557		0.0472	U	0.0515	J	8640		210		47.3		63.6	
Fluorene	L		0.0481	U	27.6		0.194		510000		710		0.0472	U	0.0476	U	8310		191		267		225	
Indeno (1,2,3-cd) pyrene	H, C		0.0481	U	0.0481	U	0.0485	U	12000	U	6.49	J	0.0472	U	0.0476	U	116		23.8	U	1.04	U	4.76	U
Napthalene	L		0.0481	U	2.22		0.738		1860000		14400		0.0472	U	0.0476	U	15800		263		6760		4010	
Phenanthrene	L		0.0481	U	2.18		0.458		971000		1530		0.0472	U	0.0476	U	18100		279		247		241	
Pyrene	H		0.0481	U	0.312		0.181		277000		375		0.0472	U	0.0476	U	6370		137		28		38.9	
Total LPAHs			0.144	U	153		1.66		4000000		17800		0.142	U	0.143	U	53700		1050		7800		4840	
Total HPAHs			0.265	U	0.475		0.577		1030000		1260		0.260	U	0.052		20500		511		89.9		135	
Total cPAHs			0.216	U	0.216	U	0.130		310000		329		0.212	U	0.214	U	5530		164		14.6		32.8	
Total PAHs			0.409	U	154		2.23		5030000		19100		0.401	U	0.194		74200		1560		7890		4970	
FIELD PARAMETERS																								
Temperature (°C)			19.75		18.44		19.07		--		--		16.01		15.83		--		--		15.32		--	
Oxidation Reduction Potential (mV)			96		-130		-98		--		--		-144		-101		--		--		91		--	
pH			6.18		7.36		6.83		--		--		6.52		6.17		--		--		6.5		--	
Specific Conductance (mS/cm)			0.434		57.6		65.1		--		--		0.767		0.807		--		--		71.7		--	
Turbidity (NTU)			17.6		6.5		6		--		--		83.7		52.6		--		--		4.9		--	
Dissolved Oxygen (mg/L)			1.3		1.8		0.1		--		--		0		0		--		--		3.8		--	

Table V-3: Spring 2006 and 2010 Groundwater Quality Results
McCormick & Baxter Superfund Site
Portland, Oregon

SAMPLE LOCATION			EW-10s		EW-15s		EW-18s		EW-19s[3]		EW-19s		EW-23s		Rinsate1-051706		Rinsate2-052206	
Sample Date			5/19/2006		5/22/2006		5/22/2006		5/17/2006		5/6/2010		5/22/2006		5/17/2006		5/22/2006	
Sample Time			15:41		10:30		9:20		14:12		14:55		11:55		16:55		15:42	
Well Depth			shallow		shallow		shallow		shallow		shallow		shallow					
NAPL (Historically)			NAPL		NAPL		NAPL		NAPL		NAPL		NAPL					
Inside/Outside Barrier Wall			outside		inside		inside		outside		outside		inside					
CONSTITUENTS OF INTEREST		**MCLs**																
Total Metals (mg/L)																		
Arsenic		0.01	**0.0156**		**0.0221**		**0.0291**		**0.00216**		**0.00340**		**0.0294**		0.000664	U	**0.000664**	**U**
Chromium		0.1	**0.00375**		**0.00229**		**0.000400**	**J**	**0.000380**	**J**	**0.00250**		**0.148**		**0.0163**		**0.00147**	
Copper		1.3[9]	**0.000630**	**J**	**0.00113**	**J**	**0.00271**		**0.000620**	**J**	**0.00350**		**0.00335**		**0.00045**	**J**	**0.000133**	**U**
Zinc		5[10]	0.00535	U[2]	0.00418	U[2]	0.00341	U[2]	**0.00362**	**J**	**0.00200**	**J**	0.00850	U[2]	**0.00132**	**J**	0.00109	U[2]
Pentachlorophenol (ug/L)		1	**1030**		95.2	U	95.2	U	**366**		**428**		1920	U	0.962	U	0.962	U
Polyaromatic Hydrocarbons (ug/L)																		
Acenaphthene	L		**2420**		**1150**		**616**		**67.1**		**111**		**14700**		**0.169**		**0.0646**	**J**
Acenaphthylene	L		48.1	U	19	U	19	U	12.3	U	**3.1**		**213**		0.0481	U	0.0481	U
Anthracene	L		**651**		**274**		**139**		12.3	U	**14.7**		**4200**		0.0481	U	0.0481	U
Benzo (a) anthracene	H, C		**340**		**140**		**81.7**		12.3	U	**7.3**		**2440**		0.0481	U	0.0481	U
Benzo (a) pyrene	H, C	0.2	**89.2**		**39.2**		**27.8**		12.3	U	**2.9**		**667**		0.0481	U	0.0481	U
Benzo (b) fluoranthene	H, C		**236**		**70.3**		**26.4**		12.3	U	**4.9**		**1120**		0.0481	U	0.0481	U
Benzo (k) fluoranthene	H, C		24	U	**39.4**		**34.9**		12.3	U	**1.7**		**667**		0.0481	U	0.0481	U
Benzo (ghi) perylene	H, C		24	U	**8.9**	**J**	**7.12**	**J**	12.3	U	**0.82**		**138**	**J**	0.0481	U	0.0481	U
Chrysene	H, C		**299**		**129**		**69.7**		12.3	U	**6.6**		**2180**		**0.079**	**J**	0.0481	U
Dibenzo (a,h) anthracene	H, C		48.1	U	9.52	U	9.52	U	24.5	U		R	192	U	0.0962	U	0.0962	U
Fluoranthene	H		**1740**		**673**		**420**		12.3	U	**39.3**		**12100**		**0.225**		**0.0709**	**J**
Fluorene	L		**1810**		**859**		**367**		**24**		**52.9**		**12600**		**0.117**		0.0481	U
Indeno (1,2,3-cd) pyrene	H, C		24	U	**9.95**		**7.87**	**J**	12.3	U	**0.91**		**158**	**J**	0.0481	U	0.0481	U
Napthalene	L		**18900**		**5370**		**3000**		**915**		**284**		**53200**		**2.88**		**0.468**	
Phenanthrene	L		**3610**		**1450**		**674**		12.3	U	**88.4**		**21800**		**0.199**		0.0481	U
Pyrene	H		**1220**		**442**		**316**		12.3	U	**28.1**		**7870**		**0.153**		**0.0487**	**J**
Total LPAHs			**27400**		**9100**		**4800**		**1010**		**554**		**107000**		**3.37**		**0.533**	
Total HPAHs			**3920**		**1550**		**991**		67.6	U	**92.5**		**27300**		**1.17**		**0.120**	
Total cPAHs			**964**		**437**		**255**		55.3	U	**25.1**		**7370**		**0.790**		0.216	U
Total PAHs			**31300**		**10700**		**5790**		**1010**		**647**		**134000**		**4.53**		**0.652**	
FIELD PARAMETERS																		
Temperature (°C)			--		--		--		21.58		14.8		--		--		--	
Oxidation Reduction Potential (mV)			--		--		--		107		31		--		--		--	
pH			--		--		--		6.47		5.61		--		--		--	
Specific Conductance (mS/cm)			--		--		--		37.5		0.39		--		--		--	
Turbidity (NTU)			--		--		--		10		7.4		--		--		--	
Dissolved Oxygen (mg/L)			--		--		--		0		0.9		--		--		--	

Table V-3: Spring 2006 and 2010 Groundwater Quality Results

McCormick & Baxter Superfund Site
Portland, Oregon

Notes:

bold Indicates the analyte was detected above MDLs.

<u>underlined-bold</u> Indicates the analyte was detected in excess of MCLs.

(grey shading) Indicates NAPL was historically present in well or during sampling.

(blue shading) Indicates 2010 analytical results.

[1] Sample ID for laboratory is MW-Er.

[2] Qualified as not detected because analytes were detected in the method blank (values represent amount detected in sample).

[3] Samples were inadvertently left out of refrigerator by Test America; all sample results for PAH's + PCP must be considered estimates only.

[4] Sample ID for laboratory is EW-31r.

[5] Due to recoveries outside of method control limits in lab MS/MSD samples, results must be considered estimated levels only.

[6] Sample ID for laboratory is MW-Bs.

[7] Free Product in Sample.

[8] Sample ID for laboratory is MW-69i.

[9] Treatment technique action level

[10] National Secondary Drinking Water Regulation

°C = degrees celsius
C = carcinogenic PAH (cPAH)
H = high molecular weight PAH (HPAH)
J = estimated value
L = low molecular weight PAH (LPAH)
NTU = nephelometric turbidity unit
mV = millivolts
mS/cm = milliSiemens/centimeter
MCL = National Primary Drinking Water Regulation Maximum Contaminant Level
MDL= method detection limit
mg/L = milligrams per liter
MRL= method reporting limit
U = value below MDL (value represents MDL)
ug/L = micrograms per liter
WC = Willamette Cove well

Table V-4: Summary of Surface Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Surface Water Fall 2005						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							26	92%	17	MBSWGB05-2A	5.9296	Gamma	7.3008
Dissolved Organic Carbon (mg/L)							26	88%	10.9	MBSWGB05-12	2.7767	NP	5.3601
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	26	100%	0.00142	MBSWGB05-04	0.0008	Gamma	0.0008
Chromium		0.21		0.074		0.1	26	0%	ND	NA	0.0004	NA	NA
Copper		0.012		0.009			26	81%	0.00283	MBSWGB05-32 (Dup. of Sample 17)	0.0010	NP	0.0012
Zinc		0.11		0.12	26		26	88%	0.00843	MBSWGB05-32 (Dup. of Sample 17)	0.0031	NP	0.0046
Dissolved Metals (mg/L)													
Arsenic							26	46%	0.000978	MBSWGB05-18	0.0004	NP	0.0006
Chromium							26	0%	ND	NA	0.0004	NA	NA
Copper							26	81%	0.0112	MBSWGB05-13	0.0014	NP	0.0031
Zinc							26	85%	0.00979	MBSWGB05-13	0.0036	Gamma	0.0046
Pentachlorophenol (mg/L)		13		15	3	1	26	0%	ND	NA	0.1745	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		26	19%	0.0972	MBSWGB05-17	0.0168	NP	0.0356
Acenaphthylene	L						26	0%	ND	NA	0.0087	NA	NA
Anthracene	L				40,000		26	0%	ND	NA	0.0087	NA	NA
Benz[a]anthracene	H, C				0.018		26	0%	ND	NA	0.0087	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	26	0%	ND	NA	0.0087	NA	NA
Benzo[b]fluoranthene	H, C				0.018		26	0%	ND	NA	0.0087	NA	NA
Benzo[g,h,i]perylene	H, C						26	0%	ND	NA	0.0087	NA	NA
Benzo[k]fluoranthene	H				0.018		26	0%	ND	NA	0.0087	NA	NA
Chrysene	H, C				0.018		26	0%	ND	NA	0.0087	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		26	0%	ND	NA	0.0174	NA	NA
Fluoranthene	H		54		140		26	0%	ND	NA	0.0087	NA	NA
Fluorene	L				5300		26	8%	0.0234	MBSWGB05-17	0.0098	NA	NA
Ideno[1,2,3-cd]pyrene	H, C				0.018		26	0%	ND	NA	0.0087	NA	NA
Naphthalene	L	620					26	15%	0.911	MBSWGB05-17	0.0663	NP	0.0444
Phenanthrene	L						26	4%	0.0129	MBSWGB05-17	0.0090	NA	NA
Pyrene	H				4,000		26	0%	ND	NA	0.0087	NA	NA
Total LPAHs							26	19%	1.0445	MBSWGB05-17	0.0931	NP	0.1150
Total HPAHs							26	4%	0.0132	MBSWGB05-32 (Dup. of Sample 17)	0.0460	NA	NA
Total cPAHs			0.031				26	0%	ND	NA	0.0414	NA	NA
Total PAHs							26	19%	1.10505	MBSWGB05-17	0.1437	NP	0.2000

Please refer to notes at end of this table.

Table V-4: Summary of Surface Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Surface Water Spring 2006						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	Number of Samples	Detection Frequency	Max Detection	Max Location	Mean Concentration[1]	Data Distribution	95% UCL Value[1]
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Dissolved Organic Carbon (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	23	22%	0.00233	Location 25	0.0006	NP	0.0011
Chromium		0.21		0.074		0.1	23	74%	0.00455	Location 14	0.0010	NP	0.0036
Copper		0.012		0.009			23	74%	0.0168	Location 18	0.0040	Max	0.0168
Zinc		0.11		0.12	26		23	87%	0.04	Location 25	0.0082	NP	0.0291
Dissolved Metals (mg/L)													
Arsenic							--	--	--	--	--	--	--
Chromium							--	--	--	--	--	--	--
Copper							--	--	--	--	--	--	--
Zinc							--	--	--	--	--	--	--
Pentachlorophenol (mg/L)		13		15	3	1	23	0%	ND	NA	0.1197	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		23	0%	ND	NA	0.0060	NA	NA
Acenaphthylene	L						23	0%	ND	NA	0.0060	NA	NA
Anthracene	L				40,000		23	0%	ND	NA	0.0060	NA	NA
Benz[a]anthracene	H, C				0.018		23	0%	ND	NA	0.0060	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	23	4%	0.0146	Location 13	0.0064	NA	NA
Benzo[b]fluoranthene	H, C				0.018		23	4%	0.0124	Location 13	0.0063	NA	NA
Benzo[g,h,i]perylene	H, C						23	0%	0.0062	Location 12	0.0060	NA	NA
Benzo[k]fluoranthene	H				0.018		23	4%	0.0119	Location 13	0.0063	NA	NA
Chrysene	H, C				0.018		23	9%	0.0195	Location 25	0.0069	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		23	0%	ND	NA	0.0120	NA	NA
Fluoranthene	H		54		140		23	9%	0.0396	Location 25	0.0085	NA	NA
Fluorene	L				5300		23	0%	ND	NA	0.0060	NA	NA
Ideno[1,2,3-cd]pyrene	H, C				0.018		23	0%	ND	NA	0.0060	NA	NA
Naphthalene	L	620					23	26%	0.19	Location 25	0.0173	NP	0.0523
Phenanthrene	L						23	4%	0.0159	Location 13	0.0064	NA	NA
Pyrene	H				4,000		23	13%	0.0319	Location 25	0.0082	NP	0.0104
Total LPAHs							23	26%	0.19	Location 25	0.0402	NP	0.0709
Total HPAHs							23	13%	0.1066	Location 13	0.0717	NP	0.0855
Total cPAHs			0.031				23	9%	0.053	Location 13	0.0524	NA	NA
Total PAHs							23	30%	0.281	Location 25	0.0936	NP	0.1450

Please refer to notes at end of this table.

Table V-4: Summary of Surface Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Surface Water Fall 2006						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							22	95%	20	Location 19	5.6905	Lognormal	7.2709
Dissolved Organic Carbon (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	95%	0.00071	Location 25	0.0005	Gamma	0.0005
Chromium		0.21		0.074		0.1	22	64%	0.00234	Location 3	0.0003	NP	0.0007
Copper		0.012		0.009			22	100%	0.00344	Location 3	0.0011	NP	0.0014
Zinc		0.11		0.12	26		22	27%	0.00482	Location 7	0.0016	NP	0.0028
Dissolved Metals (mg/L)													
Arsenic							21	95%	0.00061	Location 18	0.0004	NP	0.0005
Chromium							21	52%	0.00013	Location 11	0.0001	NP	0.0001
Copper							21	100%	0.00132	Location 25	0.0007	NP	0.0008
Zinc							21	71%	0.00487	Location 11	0.0028	NP	0.0068
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.1239	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	23%	0.166	Location 25	0.0190	NP	0.0534
Acenaphthylene	L						22	5%	0.0126	Location 4	0.0065	NA	NA
Anthracene	L				40,000		22	5%	0.0126	Location 4	0.0065	NA	NA
Benz[a]anthracene	H, C				0.018		22	5%	0.0126	Location 4	0.0065	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0062	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	5%	0.0126	Location 4	0.0065	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0062	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0062	NA	NA
Chrysene	H, C				0.018		22	5%	0.0126	Location 4	0.0065	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0124	NA	NA
Fluoranthene	H		54		140		22	5%	0.0143	Location 14	0.0066	NA	NA
Fluorene	L				5300		22	9%	0.062	Location 25	0.0098	NA	NA
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0062	NA	NA
Naphthalene	L	620					22	18%	0.93	Location 25	0.0873	NP	0.6179
Phenanthrene	L						22	9%	0.0295	Location 25	0.0075	NA	NA
Pyrene	H				4,000		22	9%	0.0128	Location 14	0.0068	NA	NA
Total LPAHs							22	18%	1.1875	Location 25	0.1313	NP	0.4080
Total HPAHs							22	0%	ND	NA	0.0681	NA	NA
Total cPAHs			0.031				22	0%	ND	NA	0.0557	NA	NA
Total PAHs							22	23%	1.1875	Location 25	0.1429	NP	0.4160

Please refer to notes at end of this table.

Table V-4: Summary of Surface Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Surface Water Spring 2007						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							23	100%	12	Location 6	7.2609	Normal	8.4000
Dissolved Organic Carbon (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	23	100%	0.00041	Location 6	0.0003	Normal	0.0003
Chromium		0.21		0.074		0.1	23	52%	0.00165	Location 26	0.0004	NP	0.0015
Copper		0.012		0.009			23	100%	0.00315	Location 19	0.0014	NP	0.0016
Zinc		0.11		0.12	26		23	35%	0.0216	Location 20	0.0028	NP	0.0068
Dissolved Metals (mg/L)													
Arsenic							23	83%	0.00004	Location 10	0.0000	NP	0.0003
Chromium							23	100%	0.00039	Location 10	0.0004	Normal	0.0004
Copper							23	100%	0.00053	Location 10	0.0005	NP	0.0007
Zinc							23	83%	0.00158	Location 10	0.0003	NP	0.0120
Pentachlorophenol (mg/L)		13		15	3	1	23	0%	ND	N/A	0.1229	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		23	0%	ND	N/A	0.0061	NA	NA
Acenaphthylene	L						23	0%	ND	N/A	0.0061	NA	NA
Anthracene	L				40,000		23	0%	ND	N/A	0.0061	NA	NA
Benz[a]anthracene	H, C				0.018		23	0%	ND	N/A	0.0061	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	23	0%	ND	N/A	0.0061	NA	NA
Benzo[b]fluoranthene	H, C				0.018		23	0%	ND	N/A	0.0061	NA	NA
Benzo[g,h,i]perylene	H, C						23	0%	ND	N/A	0.0061	NA	NA
Benzo[k]fluoranthene	H				0.018		23	0%	ND	N/A	0.0061	NA	NA
Chrysene	H, C				0.018		23	0%	ND	N/A	0.0061	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		23	0%	ND	N/A	0.0123	NA	NA
Fluoranthene	H		54		140		23	4%	0.0133	Location 19	0.0065	NA	NA
Fluorene	L				5300		23	0%	ND	N/A	0.0061	NA	NA
Ideno[1,2,3-cd]pyrene	H, C				0.018		23	0%	ND	N/A	0.0061	NA	NA
Naphthalene	L	620					23	0%	ND	N/A	0.0064	NA	NA
Phenanthrene	L						23	0%	ND	N/A	0.0061	NA	NA
Pyrene	H				4,000		23	0%	ND	N/A	0.0061	NA	NA
Total LPAHs							23	0%	ND	N/A	0.0371	NA	NA
Total HPAHs							23	4%	0.0133	Location 19	0.0652	NA	NA
Total cPAHs			0.031				23	0%	ND	N/A	0.0553	NA	NA
Total PAHs							23	4%	0.0133	Location 19	0.1007	NA	NA

Please refer to notes at end of this table.

Table V-4: Summary of Surface Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Surface Water Fall 2007						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	Number of Samples	Detection Frequency	Max Detection	Max Location	Mean Concentration[1]	Data Distribution	95% UCL Value[1]
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							22	91%	86	Location 25	19.0427	Log	36.4492
Dissolved Organic Carbon (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	100%	0.00143	Location 17	0.0007	NP	0.0010
Chromium		0.21		0.074		0.1	22	55%	0.000825	Location 10	0.0003	Log	0.0004
Copper		0.012		0.009			22	86%	0.00223	Location 12	0.0012	Normal	0.0014
Zinc		0.11		0.12	26		22	68%	0.00445	Location 12	0.0027	Max	0.0045
Dissolved Metals (mg/L)													
Arsenic							22	9%	0.000967	Location 17	0.0004	NA	NA
Chromium							22	0%	ND	N/A	0.0001	NA	NA
Copper							22	95%	0.00103	Location 25	0.0007	Normal	0.0072
Zinc							22	73%	0.0058	Location 2	0.0024	NP	0.0036
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	N/A	0.1189	NP	0.1191
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	45%	0.411	Location 12	0.0681	NP	0.3359
Acenaphthylene	L						22	9%	0.0581	Location 17	0.0088	NA	NA
Anthracene	L				40,000		22	0%	ND	N/A	0.0059	NA	NA
Benz[a]anthracene	H, C				0.018		22	0%	ND	N/A	0.0059	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	N/A	0.0059	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	ND	N/A	0.0059	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	N/A	0.0059	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	N/A	0.0059	NA	NA
Chrysene	H, C				0.018		22	0%	ND	N/A	0.0059	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	N/A	0.0119	NA	NA
Fluoranthene	H		54		140		22	14%	0.0286	Location 12	0.0084	NP	0.0109
Fluorene	L				5300		22	27%	0.254	Location 17	0.0295	NP	0.1574
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	N/A	0.0059	NA	NA
Naphthalene	L	620					22	50%	1.33	Location 7	0.1937	NP	1.0255
Phenanthrene	L						22	23%	0.073	Location 17	0.0148	NP	0.0319
Pyrene	H				4,000		22	14%	0.0277	Location 12	0.0083	NP	0.0108
Total LPAHs							22	68%	1.9901	Location 17	0.3028	NP	0.8100
Total HPAHs							22	14%	0.0563	Location 12	0.0626	NP	0.0690
Total cPAHs			0.031				22	0%	ND	N/A	0.0522	NA	NA
Total PAHs							22	68%	1.9901	Location 17	0.3200	NP	0.7970

Please refer to notes at end of this table.

Table V-4: Summary of Surface Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Surface Water Spring 2008						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Dissolved Organic Carbon (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	0%	ND	NA	0.0003	NA	NA
Chromium		0.21		0.074		0.1	22	77%	0.00097	Location 18	0.0004	NP	0.0006
Copper		0.012		0.009			22	77%	0.00348	Location 12	0.0011	Normal	0.0012
Zinc		0.11		0.12	26		22	9%	0.0125	Location 25	0.0031	NA	NA
Dissolved Metals (mg/L)													
Arsenic							22	0%	ND	NA	0.0003	NA	NA
Chromium							22	45%	0.000319	Location 26	0.0001	NP	0.0002
Copper							22	64%	0.00455	Location 13	0.0011	NP	0.0020
Zinc							22	36%	0.0136	Location 25	0.0027	Normal	0.0037
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.1196	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	14%	0.0661	Location 2	0.0125	NP	0.0287
Acenaphthylene	L						22	0%	ND	NA	0.0060	NA	NA
Anthracene	L				40,000		22	0%	ND	NA	0.0060	NA	NA
Benz[a]anthracene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0060	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0060	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0060	NA	NA
Chrysene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0120	NA	NA
Fluoranthene	H		54		140		22	0%	ND	NA	0.0060	NA	NA
Fluorene	L				5300		22	14%	0.0237	Location 2	0.0078	Normal	0.0096
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Naphthalene	L	620					22	18%	0.0934	Location 25	0.0135	Normal	0.0324
Phenanthrene	L						22	0%	ND	NA	0.0060	NA	NA
Pyrene	H				4,000		22	0%	ND	NA	0.0060	NA	NA
Total LPAHs							22	18%	0.1475	Location 25	0.0463	NP	0.0789
Total HPAHs							22	0%	ND	NA	0.0628	NA	NA
Total cPAHs			0.031				22	0%	ND	NA	0.0514	NA	NA
Total PAHs							22	18%	0.1475	Location 25	0.0971	Normal	0.1220

Please refer to notes at end of this table.

Table V-4: Summary of Surface Water Data

McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Surface Water Fall 2008						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Dissolved Organic Carbon (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	91%	0.00132	Location 26	0.0005	Gamma	0.0006
Chromium		0.21		0.074		0.1	22	36%	0.00257	Location 13	0.0005	NP	0.0012
Copper		0.012		0.009			22	100%	0.00282	Location 18	0.0011	Gamma	0.0013
Zinc		0.11		0.12	26		22	100%	0.0111	Location 26	0.0057	Normal	0.0064
Dissolved Metals (mg/L)													
Arsenic							22	86%	0.0018	Location 26	0.0004	Log	0.0005
Chromium							22	5%	ND	NA	0.0002	NA	NA
Copper							22	82%	0.00403	Location 13	0.0009	Log	0.0017
Zinc							22	100%	0.005	Location 2	0.0044	Normal	0.0048
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.1245	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	14%	0.704	Location 26	0.0442	NP	0.3600
Acenaphthylene	L						22	0%	ND	NA	0.0060	NA	NA
Anthracene	L				40,000		22	0%	ND	NA	0.0060	NA	NA
Benz[a]anthracene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0060	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0060	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0060	NA	NA
Chrysene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0119	NA	NA
Fluoranthene	H		54		140		22	5%	0.0239	Location 26	0.0068	NA	NA
Fluorene	L				5300		22	14%	0.262	Location 26	0.0192	NP	0.0698
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Naphthalene	L	620					22	9%	2.93	Location 26	0.1541	NA	NA
Phenanthrene	L						22	5%	0.0566	Location 26	0.0083	NA	NA
Pyrene	H				4,000		22	0%	ND	NA	0.0060	NA	NA
Total LPAHs							22	14%	3.95	Location 26	0.2343	NP	1.0100
Total HPAHs							22	5%	0.0239	Location 26	0.0620	NA	NA
Total cPAHs			0.031				22	0%	ND	NA	0.0527	NA	NA
Total PAHs							22	14%	3.98	Location 26	0.2908	NP	1.0590

Please refer to notes at end of this table.

Table V-4: Summary of Surface Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Surface Water Spring 2009						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							22	100%	83	Location 13	52.0000	Student's T	58.2600
Total Suspended Solids (mg/L)							22	82%	25	Location 25	4.5900	Gamma	6.4000
Dissolved Organic Carbon (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	100%	0.0018	Location 19	0.0005	NP	0.0008
Chromium		0.21		0.074		0.1	22	100%	0.0095	Location 19	0.0013	NP	0.0031
Copper		0.012		0.009			22	95%	0.015	Location 19	0.0026	NP	0.0053
Zinc		0.11		0.12	26		22	23%	0.032	Location 19	0.0062	NP	0.0116
Dissolved Metals (mg/L)													
Arsenic							22	100%	0.0004	Location 3	0.0003	NP	0.0003
Chromium							22	95%	0.001	Location 8	0.0003	NP	0.0005
Copper							22	59%	0.0017	Location 5	0.0008	NP	0.0012
Zinc							22	9%	0.023	Location 3	0.0039	NA	NA
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.1609	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	9%	0.02	Location 2	0.0059	NA	NA
Acenaphthylene	L						22	5%	0.01	Location 4	0.0050	NA	NA
Anthracene	L				40,000		22	0%	ND	NA	0.0048	NA	NA
Benz[a]anthracene	H, C				0.018		22	5%	0.011	Location 15	0.0050	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0048	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	5%	0.012	Location 15	0.0051	NA	NA
Benzo[g,h,i]perylene	H, C						22	5%	0.015	Location 15	0.0052	NA	NA
Benzo[k]fluoranthene	H				0.018		22	5%	0.011	Location 15	0.0050	NA	NA
Chrysene	H, C				0.018		22	5%	0.011	Location 15	0.0050	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0048	NA	NA
Fluoranthene	H		54		140		22	9%	0.012	Location 15	0.0054	NA	NA
Fluorene	L				5300		22	27%	0.094	Location 2	0.0280	NP	0.1010
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0048	NA	NA
Naphthalene	L	620					22	23%	0.11	Location 13	0.0168	NP	0.2240
Phenanthrene	L						22	0%	ND	NA	0.0048	NA	NA
Pyrene	H				4,000		22	5%	0.011	Location 25	0.0051	NA	NA
Total LPAHs							22	50%	0.114	Location 2	0.0525	NP	0.1530
Total HPAHs							22	9%	0.072	Location 15	0.0466	NA	NA
Total cPAHs			0.031				22	5%	0.06	Location 15	0.0382	NA	NA
Total PAHs							22	59%	0.1158	Location 12	0.0735	NP	0.1690

Please refer to notes at end of this table.

Table V-4: Summary of Surface Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Surface Water Fall 2009						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							22	100%	73	Location 11	58.6818	Lognormal	61.0600
Total Suspended Solids (mg/L)							21	100%	37.2	Location 16	23.0857	Normal	25.1800
Dissolved Organic Carbon (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	73%	0.00071	Location 19	0.0004	NP	0.0005
Chromium		0.21		0.074		0.1	22	45%	0.00046	Location 09	0.0002	NP	0.0003
Copper		0.012		0.009			22	100%	0.0015	Location 04	0.0010	NP	0.0011
Zinc		0.11		0.12	26		22	73%	0.0065	Location 10	0.0029	NP	0.0034
Dissolved Metals (mg/L)													
Arsenic							22	100%	0.00086	Location 19	0.0005	Gamma	0.0005
Chromium							22	23%	0.00062	Location 25	0.0002	NP	0.0002
Copper							22	100%	0.0015	Location 19	0.0007	NP	0.0008
Zinc							22	27%	0.0089	Location 13	0.0020	NP	0.0020
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.0003	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	23%	0.098	Location 05	0.0164	NP	0.0534
Acenaphthylene	L						22	0%	ND	NA	0.0076	NA	NA
Anthracene	L				40,000		22	0%	ND	NA	0.0076	NA	NA
Benz[a]anthracene	H, C				0.018		22	0%	ND	NA	0.0076	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0076	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	ND	NA	0.0076	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0076	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0076	NA	NA
Chrysene	H, C				0.018		22	0%	ND	NA	0.0076	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0076	NA	NA
Fluoranthene	H		54		140		22	5%	0.016	Location 25	0.0079	NA	NA
Fluorene	L				5300		22	14%	0.036	Location 05	0.0097	NP	0.0121
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0076	NA	NA
Naphthalene	L	620					22	23%	0.51	Location 05	0.0493	NP	0.0894
Phenanthrene	L						22	5%	0.0205	Location 03	0.0093	NA	NA
Pyrene	H				4,000		22	0%	ND	NA	0.0076	NA	NA
Total LPAHs							22	27%	0.6715	Location 05	0.0758	NP	0.2260
Total HPAHs							22	5%	0.09975	Location 05	0.0742	NA	NA
Total cPAHs			0.031				22	5%	0.07225	Location 25	0.0645	NA	NA
Total PAHs							22	27%	0.709	Location 05	0.1173	NP	0.2300

Please refer to notes at end of this table.

Table V-4: Summary of Surface Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Surface Water Spring 2010						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	Number of Samples	Detection Frequency	Max Detection	Max Location	Mean Concentration[1]	Data Distribution	95% UCL Value[1]
Total Dissolved Solids (mg/L)							22	100%	85	Location 07	62.5455	Normal	66.7000
Total Suspended Solids (mg/L)							22	100%	74.3	Location 16	16.8455	Normal	65.8000
Dissolved Organic Carbon (mg/L)													
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	100%	0.00052	Location 16	0.0004	Normal	0.0004
Chromium		0.21		0.074		0.1	22	100%	0.0013	Location 06	0.0009	Normal	0.0010
Copper		0.012		0.009			22	100%	0.0025	Location 20	0.0016	Normal	0.0017
Zinc		0.11		0.12	26		22	100%	0.0064	Location 21	0.0039	Nonparametric	0.0663
Dissolved Metals (mg/L)													
Arsenic							22	100%	0.00036	Location 06	0.0002	Normal	0.0002
Chromium							22	50%	0.00048	Location 13	0.0002	Nonparametric	0.0003
Copper							22	100%	0.003	Location 21	0.0011	Gamma	0.0013
Zinc							22	100%	0.003	Location 21	0.0020	Normal	0.0022
Pentachlorophenol (mg/L)		13		15	3	1	22	5%	0.32	Location 9	0.0836	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	14%	0.33	Location 12	0.0200	Nonparametric	0.0847
Acenaphthylene	L						22	0%	ND	NA	0.0021	NA	NA
Anthracene	L				40,000		22	0%	ND	NA	0.0026	NA	NA
Benz[a]anthracene	H, C				0.018		22	0%	ND	NA	0.0016	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0016	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	ND	NA	0.0026	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0010	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0026	NA	NA
Chrysene	H, C				0.018		22	0%	ND	NA	0.0016	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0021	NA	NA
Fluoranthene	H		54		140		22	14%	0.021	Location 12	0.0040	NA	NA
Fluorene	L				5300		22	14%	0.09	Location 12	0.0063	Nonparametric	0.0238
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0021	NA	NA
Naphthalene	L	620					22	0%	ND	NA	0.0026	NA	NA
Phenanthrene	L						22	0%	ND	NA	0.0031	NA	NA
Pyrene	H				4,000		22	14%	0.016	Location 12	0.0045	NA	NA
Total LPAHs							22	14%	0.42	Location 12	0.0344	Nonparametric	0.1150
Total HPAHs							22	14%	0.027	Location 25	0.0209	NA	NA
Total cPAHs			0.031				22	0%	ND	NA	0.0148	NA	NA
Total PAHs							22	18%	0.441	Location 12	0.0540	Nonparametric	0.1350

Please refer to notes at end of this table.

Table V-4: Summary of Surface Water Data

McCormick & Baxter Superfund Site
Portland, Oregon

Notes:

[1]The number of significant figures presented in the table do not reflect true accuracy presented by the laboratory results. Data should only retain 3 significant figures. Due to statistical evaluation using Microsoft Excel, additional significant figures may be shown.

[2] The 1996 Record of Decision (ROD) specifies the remedial action objectives of the sediment cap as: 1) preventing human and aquatic organisms from direct contact with contaminated sediment; and 2) minimizing releases of contaminants from sediment that might result in contamination of the Willamette River in excess of Ambient Water Quality Criteria (AWQCs).

[3] National Recommended Water Quality Criteria (NRWQCs) published as of August 15, 2007, are included for comparison (see http://water.epa.gov/scitech/swguidance/standards/current/index.cfm).

[4] National Primary Drinking Water Regulations Maximum Contaminant Levels (MCLs) promulgated as of August 15, 2007, are included for comparison (see http://water.epa.gov/drink/contaminants/index.cfm).

Key:

C = carcinogenic PAH (cPAH)
Gamma = gamma distribution
H = high molecular weight PAH (HPAH)
J = estimated value
L = low molecular weight PAH (LPAH)
µg/L = micrograms per liter
mg/L = milligrams per liter
MRL = method reporting limit
NA= not applicable
ND = not detected
NP = nonparametric distribution
U = value below MDL (value represents MDL)

Table V-5: Summary of Inter-Armoring Water Data

McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Inter-Armoring Water Spring 2006						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	23	30%	0.00493	Location 5	0.0012	NP	0.0023
Chromium		0.21		0.074		0.1	23	43%	0.0105	Location 12	0.0008	NP	0.0053
Copper		0.012		0.009			23	96%	0.0168	Location 12	0.0026	NP	0.0056
Zinc		0.11		0.12	26		23	78%	0.0392	Location 12	0.0069	NP	0.0154
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.1200	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	32%	3.65	Location 5	0.3208	NP	2.3228
Acenaphthylene	L						22	5%	0.0736	Location 10	0.0093	NA	NA
Anthracene	L				40,000		22	5%	0.199	Location 5	0.0148	NA	NA
Benz[a]anthracene	H, C				0.018		22	5%	0.0134	Location 5	0.0063	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0060	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0060	NA	NA
Chrysene	H, C				0.018		22	5%	0.0186	Location 5	0.0066	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0120	NA	NA
Fluoranthene	H		54		140		22	5%	0.253	Location 5	0.0172	NA	NA
Fluorene	L				5300		22	9%	1.99	Location 5	0.0981	NA	NA
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Naphthalene	L	620					22	50%	1.13	Location 5	0.0850	NP	0.6037
Phenanthrene	L						22	14%	1.73	Location 5	0.0861	NP	0.8651
Pyrene	H				4,000		22	5%	0.138	Location 5	0.0120	NA	NA
Total LPAHs							22	55%	8.699	Location 5	0.6011	NP	2.3770
Total HPAHs							22	5%	0.423	Location 5	0.0880	NA	NA
Total cPAHs			0.031				22	5%	0.032	Location 5	0.0530	NA	NA
Total PAHs							22	55%	9.122	Location 5	0.6503	NP	2.4900

Please refer to notes at end of this table.

Table V-5: Summary of Inter-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Inter-Armoring Water Fall 2006						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	100%	0.00206	Location 21	0.0007	NP	0.0008
Chromium		0.21		0.074		0.1	22	64%	0.00216	Location 3	0.0004	NP	0.0015
Copper		0.012		0.009			22	100%	0.00435	Location 20	0.0017	Lognormal	0.0022
Zinc		0.11		0.12	26		22	45%	0.0147	Location 17	0.0032	NP	0.0113
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	22	14%	0.25	Location 6	0.1351	NP	0.1495
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	23%	1.81	Location 20	0.0961	NP	0.9105
Acenaphthylene	L						22	18%	0.0506	Location 20	0.0088	NP	0.0126
Anthracene	L				40,000		22	14%	0.0161	Location 20	0.0070	NP	0.0080
Benz[a]anthracene	H, C				0.018		22	14%	0.0187	Location 5	0.0070	NP	0.0082
Benzo[b]fluoranthene	H, C				0.018		22	14%	0.0125	Location 6	0.0067	NP	0.0075
Benzo[k]fluoranthene	H				0.018		22	14%	0.0136	Location 5	0.0068	NP	0.0076
Benzo[a]pyrene	H, C				0.018	0.2	22	14%	0.0125	Location 6	0.0067	NP	0.0075
Benzo[g,h,i]perylene	H, C						22	9%	0.0125	Location 6	0.0065	NA	NA
Chrysene	H, C				0.018		22	14%	0.0236	Location 5	0.0073	NP	0.0088
Dibenzo[a,h]anthracene	H, C				0.018		22	9%	0.025	Location 6	0.0129	NP	0.0140
Fluoranthene	H		54		140		22	18%	0.111	Location 5	0.0123	NP	0.0333
Fluorene	L				5300		22	18%	0.398	Location 20	0.0282	NP	0.2078
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	9%	0.0125	Location 6	0.0065	NA	NA
Naphthalene	L	620					22	36%	2.08	Location 20	0.1364	NP	1.0949
Phenanthrene	L						22	14%	0.147	Location 20	0.0185	NP	0.0557
Pyrene	H				4,000		22	23%	0.0601	Location 5	0.0099	NP	0.0208
Total LPAHs							22	36%	4.5017	Location 20	0.2830	NP	1.1750
Total HPAHs							22	18%	0.227	Location 5	0.0718	NP	0.1060
Total cPAHs			0.031				22	9%	0.0559	Location 5	0.0556	NA	NA
Total PAHs							22	41%	4.5469	Location 20	0.3036	NP	1.2090

Please refer to notes at end of this table.

Table V-5: Summary of Inter-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Inter-Armoring Water Spring 2007						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	23	13%	0.00713	Location 5	0.0007	NP	0.0038
Chromium		0.21		0.074		0.1	23	13%	0.0227	Location 5	0.0020	Gamma	0.0040
Copper		0.012		0.009			23	100%	0.037	Location 5	0.0053	NP	0.0124
Zinc		0.11		0.12	26		23	4%	0.03325	Location 5	0.0051	NA	NA
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	23	0%	ND	NA	0.1228	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		23	13%	0.115	Location 20	0.0143	NP	0.0375
Acenaphthylene	L						23	0%	ND	NA	0.0061	NA	NA
Anthracene	L				40,000		23	0%	ND	NA	0.0061	NA	NA
Benz[a]anthracene	H, C				0.018		23	0%	ND	NA	0.0061	NA	NA
Benzo[b]fluoranthene	H, C				0.018		23	0%	ND	NA	0.0061	NA	NA
Benzo[k]fluoranthene	H				0.018		23	0%	ND	NA	0.0061	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	23	0%	ND	NA	0.0061	NA	NA
Benzo[g,h,i]perylene	H, C						23	0%	ND	NA	0.0061	NA	NA
Chrysene	H, C				0.018		23	0%	ND	NA	0.0061	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		23	0%	ND	NA	0.0123	NA	NA
Fluoranthene	H		54		140		23	0%	ND	NA	0.0061	NA	NA
Fluorene	L				5300		23	9%	0.0345	Location 20	0.0078	NA	NA
Ideno[1,2,3-cd]pyrene	H, C				0.018		23	0%	ND	NA	0.0061	NA	NA
Naphthalene	L	620					23	0%	ND	NA	0.0066	NA	NA
Phenanthrene	L						23	0%	ND	NA	0.0061	NA	NA
Pyrene	H				4,000		23	0%	ND	NA	0.0061	NA	NA
Total LPAHs							23	17%	0.1495	Location 20	0.0416	NP	0.0643
Total HPAHs							23	0%	ND	NA	0.0678	NA	NA
Total cPAHs			0.031				23	0%	ND	NA	0.0553	NA	NA
Total PAHs							23	17%	0.1495	Location 20	0.0974	NP	0.1230

Please refer to notes at end of this table.

Table V-5: Summary of Inter-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Inter-Armoring Water Fall 2007						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	100%	0.00202	Location 13	0.0010	Normal	0.0012
Chromium		0.21		0.074		0.1	22	55%	0.00456	Location 16	0.0009	Gamma	0.0014
Copper		0.012		0.009			22	86%	0.00858	Location 16	0.0025	Gamma	0.0033
Zinc		0.11		0.12	26		22	64%	0.0222	Location 16	0.0068	Gamma	0.0093
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.1140	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	0%	ND	NA	0.0280	NA	NA
Acenaphthylene	L						22	9%	0.0673	Location 17	0.0091	NA	NA
Anthracene	L				40,000		22	0%	ND	NA	0.0059	NA	NA
Benz[a]anthracene	H, C				0.018		22	0%	ND	NA	0.0059	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	ND	NA	0.0059	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0059	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0059	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0059	NA	NA
Chrysene	H, C				0.018		22	0%	ND	NA	0.0059	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0119	NA	NA
Fluoranthene	H		54		140		22	32%	0.0173	Location 10	0.0084	NP	0.0098
Fluorene	L				5300		22	0%	ND	NA	0.0149	NA	NA
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0059	NA	NA
Naphthalene	L	620					22	0%	ND	NA	0.0474	NA	NA
Phenanthrene	L						22	0%	ND	NA	0.0089	NA	NA
Pyrene	H				4,000		22	5%	0.0141	Location 10	0.0063	NA	NA
Total LPAHs							22	9%	0.0673	Location 17	0.0779	NA	NA
Total HPAHs							22	32%	0.0314	Location 10	0.0493	NP	0.0714
Total cPAHs			0.031				22	0%	ND	NA	0.0534	NA	NA
Total PAHs							22	36%	0.0812	Location 17	0.0854	NP	0.1470

Please refer to notes at end of this table.

Table V-5: Summary of Inter-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Inter-Armoring Water Spring 2008						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	5%	0.00078	Location 14	0.0004	NA	NA
Chromium		0.21		0.074		0.1	22	91%	0.00229	Location 14	0.0006	Lognormal	0.0008
Copper		0.012		0.009			22	82%	0.00528	Location 7	0.0019	Gamma	0.0023
Zinc		0.11		0.12	26		22	27%	0.172	Location 9	0.0117	NP	0.0879
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.1198	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	14%	0.0582	Location 2	0.0107	NP	0.0233
Acenaphthylene	L						22	0%	ND	NA	0.0060	NA	NA
Anthracene	L				40,000		22	0%	ND	NA	0.0060	NA	NA
Benz[a]anthracene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0060	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0060	NA	NA
Chrysene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0120	NA	NA
Fluoranthene	H		54		140		22	0%	ND	NA	0.0060	NA	NA
Fluorene	L				5300		22	9%	0.0157	Location 2	0.0067	NA	NA
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Naphthalene	L	620					22	27%	0.0521	Location 2	0.0112	NP	0.0218
Phenanthrene	L						22	0%	ND	NA	0.0060	NA	NA
Pyrene	H				4,000		22	0%	ND	NA	0.0060	NA	NA
Total LPAHs							22	32%	0.126	Location 2	0.0381	NP	0.0609
Total HPAHs							22	0%	ND	NA	0.0644	NA	NA
Total cPAHs			0.031				22	0%	ND	NA	0.0527	NA	NA
Total PAHs							22	32%	0.126	Location 2	0.0806	NP	0.1150

Please refer to notes at end of this table.

Table V-5: Summary of Inter-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Inter-Armoring Water Fall 2008						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	95%	0.00257	Location 14	0.0008	Gamma	0.0011
Chromium		0.21		0.074		0.1	22	55%	0.0109	Location 14	0.0014	NP	0.0023
Copper		0.012		0.009			22	100%	0.0236	Location 14	0.0038	Normal	0.0084
Zinc		0.11		0.12	26		22	77%	0.058	Location 14	0.0109	Normal	0.0220
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.1192	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	18%	0.184	Location 26	0.0213	NP	0.0363
Acenaphthylene	L						22	0%	ND	NA	0.0060	NA	NA
Anthracene	L				40,000		22	0%	ND	NA	0.0060	NA	NA
Benz[a]anthracene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0060	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0060	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0060	NA	NA
Chrysene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0119	NA	NA
Fluoranthene	H		54		140		22	5%	0.017	Location 7	0.0065	NA	NA
Fluorene	L				5300		22	14%	0.0692	Location 26	0.0107	NP	0.0247
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Naphthalene	L	620					22	14%	0.488	Location 26	0.0312	NP	0.2500
Phenanthrene	L						22	5%	0.0154	Location 26	0.0064	NA	NA
Pyrene	H				4,000		22	5%	0.0181	Location 7	0.0065	Normal	0.0076
Total LPAHs							22	18%	0.757	Location 26	0.0772	NP	0.0711
Total HPAHs							22	5%	0.0351	Location 7	0.0625	NA	NA
Total cPAHs			0.031				22	0%	ND	NA	0.0527	NA	NA
Total PAHs							22	18%	0.757	Location 26	0.1308	NP	0.2620

Please refer to notes at end of this table.

Table V-5: Summary of Inter-Armoring Water Data

McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Inter-Armoring Water Spring 2009						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							22	100%	100	Location 15	58	Student's T	64.37
Total Suspended Solids (mg/L)							22	86%	150	Location 4	15	NP	45.52
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	100%	0.0071	Location 7	0.0009	NP	0.0022
Chromium		0.21		0.074		0.1	22	100%	0.0043	Location 4	0.0018	Student's T	0.0021
Copper		0.012		0.009			22	100%	0.0092	Location 17	0.0038	Gamma	0.0048
Zinc		0.11		0.12	26		22	27%	0.018	Location 4	0.0067	NP	0.0100
Dissolved Metals (mg/L)													
Arsenic							22	100%	0.0008	Location 14	0.0003	NP	0.0004
Chromium							22	91%	0.0017	Location 10	0.0003	NP	0.0006
Copper							22	82%	0.0029	Location 25	0.0011	NP	0.0017
Zinc							22	18%	0.023	Location 14	0.0046	NP	0.0088
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	0.165	Location 8	0.1602	NA	
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	18%	6	Location 20	0.2896	NP	1.4760
Acenaphthylene	L						22	0%	0.0048	Location 8	0.0048	NA	NA
Anthracene	L				40,000		22	5%	0.029	Location 20	0.0059	NA	NA
Benz[a]anthracene	H, C				0.018		22	5%	0.0095	Location 18	0.0050	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	0.0048	Location 8	0.0048	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	0.0048	Location 8	0.0048	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	0.0048	Location 8	0.0048	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	0.0048	Location 8	0.0048	NA	NA
Chrysene	H, C				0.018		22	14%	0.014	Location 18	0.0056	NP	0.0078
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	0.0048	Location 8	0.0048	NA	NA
Fluoranthene	H		54		140		22	14%	0.11	Location 7	0.0125	NP	0.0353
Fluorene	L				5300		22	27%	1.4	Location 20	0.0828	NP	0.3580
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	0.0048	Location 8	0.0048	NA	NA
Naphthalene	L	620					22	23%	0.42	Location 2	0.0407	NP	0.1410
Phenanthrene	L						22	14%	0.016	Location 20	0.0059	NP	0.0087
Pyrene	H				4,000		22	18%	0.073	Location 7	0.0101	NP	0.0249
Total LPAHs							22	45%	7.765	Location 20	0.4201	NP	1.9480
Total HPAHs							22	23%	0.183	Location 7	0.0529	NP	0.0827
Total cPAHs			0.031				22	5%	0.0403	Location 18	0.0368	NA	NA
Total PAHs							22	55%	7.861	Location 20	0.4536	NP	1.9960

Please refer to notes at end of this table.

Table V-5: Summary of Inter-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Inter-Armoring Water Fall 2009						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							22	100%	114	Location 13	64.36363636	Gamma	68.16
Total Suspended Solids (mg/L)							22	100%	1150	Location 04	117.7954545	Gamma	190.4
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	77%	0.004	Location 17	0.0007	NP	0.0014
Chromium		0.21		0.074		0.1	22	68%	0.0027	Location 04	0.0005	Gamma	0.0007
Copper		0.012		0.009			22	100%	0.0102	Location 04	0.0019	NP	0.0037
Zinc		0.11		0.12	26		22	100%	0.0303	Location 04	0.0064	NP	0.0085
Dissolved Metals (mg/L)													
Arsenic							22	100%	0.0045	Location 17	0.0007	NP	0.0015
Chromium							22	27%	0.00065	Location 04	0.0003	NP	0.0005
Copper							22	100%	0.0016	Location 04	0.0009	Normal	0.0010
Zinc							22	82%	0.0058	Location 12	0.0029	NP	0.0034
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.0003	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	32%	0.14	Location 13	0.0257	NP	0.0379
Acenaphthylene	L						22	0%	ND	NA	0.0075	NA	NA
Anthracene	L				40,000		22	5%	0.016	Location 17	0.0079	NA	NA
Benz[a]anthracene	H, C				0.018		22	0%	ND	NA	0.0075	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	ND	NA	0.0075	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0075	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0075	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0075	NA	NA
Chrysene	H, C				0.018		22	0%	ND	NA	0.0075	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0075	NA	NA
Fluoranthene	H		54		140		22	9%	0.028	Location 06	0.0089	NA	NA
Fluorene	L				5300		22	18%	0.09	Location 17	0.0153	NP	0.0347
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0075	NA	NA
Naphthalene	L	620					22	32%	0.36	Location 05	0.0310	NP	0.1030
Phenanthrene	L						22	9%	0.023	Location 06	0.0111	NA	NA
Pyrene	H				4,000		22	5%	0.023	Location 06	0.0082	NA	NA
Total LPAHs							22	45%	0.5115	Location 05	0.0754	NP	0.1880
Total HPAHs							22	9%	0.16325	Location 17	0.0815	NA	NA
Total cPAHs			0.031				22	9%	0.088	Location 06	0.0653	NA	NA
Total PAHs							22	45%	0.549	Location 05	0.1186	NP	0.2180

Please refer to notes at end of this table.

Table V-5: Summary of Inter-Armoring Water Data

McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Inter-Armoring Water Spring 2010						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							22	100%	83	Location 14	62.43	Normal	67.36
Total Suspended Solids (mg/L)							22	100%	300	Location 10	295	Gamma	489.6
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	100%	0.0105	Location 06	0.0013	Nonparametric	0.0033
Chromium		0.21		0.074		0.1	22	100%	0.047	Location 06	0.0044	Nonparametric	0.0136
Copper		0.012		0.009			22	100%	0.0751	Location 06	0.0077	Nonparametric	0.0228
Zinc		0.11		0.12	26		22	100%	0.162	Location 06	0.0178	Nonparametric	0.0492
Dissolved Metals (mg/L)													
Arsenic							22	100%	0.0077	Location 06	0.0007	Nonparametric	0.0022
Chromium							22	73%	0.00086	Location 26	0.0003	Gamma	0.0005
Copper							22	100%	0.0028	Location 06	0.0014	Gamma	0.0015
Zinc							22	100%	0.0096	Location 17	0.0034	Normal	0.0040
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.0721	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	9%	0.56	Location 12	0.0306	NA	NA
Acenaphthylene	L						22	0%	ND	NA	0.0021	NA	NA
Anthracene	L				40,000		22	0%	ND	NA	0.0026	NA	NA
Benz[a]anthracene	H, C				0.018		22	0%	ND	NA	0.0016	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	0%	ND	NA	0.0016	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0026	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0011	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0026	NA	NA
Chrysene	H, C				0.018		22	0%	ND	NA	0.0016	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0021	NA	NA
Fluoranthene	H		54		140		22	9%	0.014	Location 05	0.0032	NA	NA
Fluorene	L				5300		22	5%	0.12	Location 12	0.0072	NA	NA
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0021	NA	NA
Naphthalene	L	620					22	0%	ND	NA	0.0026	NA	NA
Phenanthrene	L						22	5%	0.018	Location 10	0.0038	NA	NA
Pyrene	H				4,000		22	9%	0.012	Location 10	0.0039	NA	NA
Total LPAHs							22	14%	0.68	Location 12	0.0468	Nonparametric	0.1770
Total HPAHs							22	9%	0.026	Location 10	0.0208	NA	NA
Total cPAHs			0.031				22	0%	ND	NA	0.0151	NA	NA
Total PAHs							22	18%	0.68	Location 12	0.0655	Nonparametric	0.1920

Please refer to notes at end of this table.

Notes:

[1]The number of significant figures presented in the table do not reflect the true accuracy presented by the laboratory results. Data should only retain 3 significant figures. Due to statistical evaluation using Microsoft Excel, additional significant figures may be shown.

[2] The 1996 Record of Decision (ROD) specifies the remedial action objectives of the sediment cap as: 1) preventing human and aquatic organisms from direct contact with contaminated sediment; and 2) minimizing releases of contaminants from sediment that might result in contamination of the Willamette River in excess of Ambient Water Quality Criteria (AWQCs).

[3] National Recommended Water Quality Criteria (NRWQCs) published as of August 15, 2007, are included for comparison (see http://water.epa.gov/scitech/swguidance/standards/current/index.cfm).

[4] National Primary Drinking Water Regulations Maximum Contaminant Levels (MCLs) promulgated as of August 15, 2007, are included for comparison (see http://water.epa.gov/drink/contaminants/index.cfm).

Key:
C = carcinogenic PAH (cPAH)
Gamma = gamma distribution
H = high molecular weight PAH (HPAH)
J = estimated value
L = low molecular weight PAH (LPAH)
µg/L = micrograms per liter
mg/L = milligrams per liter
MRL = method reporting limit
NA= not applicable
ND = not detected
NP = nonparametric distribution
U = value below MDL (value represents MDL)

Table V-6: Summary of Sub-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Sub-Armoring Water Fall 2005						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	23	100%	0.0332	MBPWPR05-26	0.0053	Gamma	0.0084
Chromium		0.21		0.074		0.1	23	39%	0.0144	MBPWPR05-09	0.0014	NP	0.0041
Copper		0.012		0.009			23	70%	0.0282	MBPWPR05-09	0.0027	NP	0.0146
Zinc		0.11		0.12	26		23	100%	0.113	MBPWPR05-09	0.0202	Gamma	0.0280
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	23	4%	0.469	MBPWPR05-17 1	0.8562	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		23	57%	131	MBPWPR05-20	16.983	NP	32.650
Acenaphthylene	L						23	13%	1.22	MBPWPR05-23	0.1160	NP	0.6744
Anthracene	L				40,000		23	39%	3.42	MBPWPR05-09	0.5349	NP	2.876
Benzo[a]anthracene	H, C				0.018		23	17%	0.959	MBPWPR05-09	0.0668	NP	0.4855
Benzo[a]pyrene	H, C				0.018	0.2	23	0%	ND	NA	0.0146	NA	NA
Benzo[b]fluoranthene	H, C				0.018		23	4%	0.284	MBPWPR05-09	0.0216	NA	NA
Benzo[g,h,i]perylene	H, C						23	4%	0.369	MBPWPR05-09	0.0252	NA	NA
Benzo[k]fluoranthene	H				0.018		23	9%	0.355	MBPWPR05-09	0.0251	NA	NA
Chrysene	H, C				0.018		23	22%	1.05	MBPWPR05-09	0.0713	NP	0.5283
Dibenzo[a,h]anthracene	H, C				0.018		23	0%	ND	NA	0.0337	NA	NA
Fluoranthene	H		54		140		23	61%	7.4	MBPWPR05-07	0.8853	NP	5.259
Fluorene	L				5300		23	61%	53.9	MBPWPR05-20	5.861	NP	11.587
Ideno[1,2,3-cd]pyrene	H, C				0.018		23	0%	ND	NA	0.0146	NA	NA
Naphthalene	L	620					23	61%	772	MBPWPR05-09	74.567	NP	522
Phenanthrene	L						23	61%	41	MBPWPR05-20	4.796	NP	8.902
Pyrene	H				4,000		23	65%	4.49	MBPWPR05-09	0.5216	NP	3.190
Total LPAHs							23	78%	886	MBPWPR05-10	103	NP	547
Total HPAHs							23	65%	14.257	MBPWPR05-09	1.590	NP	5.104
Total cPAHs			0.031				23	22%	3.017	MBPWPR05-09	0.2390	NP	0.8040
Total PAHs							23	78%	886	MBPWPR05-10	104	NP	550

Please refer to notes at end of this table.

Table V-6: Summary of Sub-Armoring Water Data

McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Sub-Armoring Water Spring 2006						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration [1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	23	91%	0.037	Location 3	0.0103	Gamma	0.0154
Chromium		0.21		0.074		0.1	23	78%	0.0169	Location 11	0.0013	Log	0.0027
Copper		0.012		0.009			23	70%	0.0352	Location 19	0.0055	Gamma	0.0107
Zinc		0.11		0.12	26		23	87%	0.388	Location 11	0.0366	Log	0.0718
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	23	4%	18.5	Location 6	0.9662	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		23	74%	22.1	Location 20	4.520	Gamma	11.201
Acenaphthylene	L						23	4%	0.3065	Location 20	0.0271	NA	NA
Anthracene	L				40,000		23	61%	0.709	Location 5	0.1116	NP	0.514
Benzo[a]anthracene	H, C				0.018		23	17%	0.0995	Location 5	0.0146	NP	0.0348
Benzo[a]pyrene	H, C				0.018	0.2	23	0%	ND	NA	0.0086	NA	NA
Benzo[b]fluoranthene	H, C				0.018		23	9%	0.06	Location 16	0.0099	NA	NA
Benzo[g,h,i]perylene	H, C						23	0%	ND	NA	0.0084	NA	NA
Benzo[k]fluoranthene	H				0.018		23	9%	0.0894	Location 5	0.0130	NA	NA
Chrysene	H, C				0.018		23	22%	0.101	Location 5	0.0158	NP	0.0366
Dibenzo[a,h]anthracene	H, C				0.018		23	0%	ND	NA	0.0167	NA	NA
Fluoranthene	H		54		140		23	65%	1.67	Location 7	0.2263	NP	1.122
Fluorene	L				5300		23	65%	10.5	Location 5	1.117	NP	6.480
Ideno[1,2,3-cd]pyrene	H, C				0.018		23	0%	0.06	Location 16	0.0084	NA	NA
Naphthalene	L	620					23	74%	726	Location 16	47.516	NP	297
Phenanthrene	L						23	52%	6.91	Location 5	0.612	NP	4.180
Pyrene	H				4,000		23	48%	0.716	Location 7	0.1075	NP	0.506
Total LPAHs							23	87%	738	Location 16	53	NP	205
Total HPAHs							23	65%	2.4248	Location 7	0.402	NP	1.039
Total cPAHs			0.031				23	22%	0.3217	Location 5	0.0889	NP	0.1980
Total PAHs							23	91%	738	Location 16	56	NP	205

Please refer to notes at end of this table.

Table V-6: Summary of Sub-Armoring Water Data

McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Sub-Armoring Water Fall 2006						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	95%	0.0386	Location 18	0.0089	Gamma	0.0142
Chromium		0.21		0.074		0.1	22	23%	0.00106	Location 25	0.0002	NP	0.0004
Copper		0.012		0.009			22	82%	0.00281	Location 15	0.0008	Gamma	0.0012
Zinc		0.11		0.12	26		22	50%	0.0263	Location 14	0.0059	NP	0.0207
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	22	14%	0.25	Location 6	0.1409	NP	0.1578
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	73%	19	Location 20	3.401	Gamma	8.510
Acenaphthylene	L						22	14%	3.27	Location 17	0.3053	NP	2.2921
Anthracene	L				40,000		22	50%	0.458	Location 9	0.0616	NP	0.299
Benzo[a]anthracene	H, C				0.018		22	18%	0.055	Location 7	0.0110	NP	0.0225
Benzo[a]pyrene	H, C				0.018	0.2	22	9%	0.0187	Location 17	0.0070	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	9%	0.0125	Location 4	0.0068	NA	NA
Benzo[g,h,i]perylene	H, C						22	14%	0.0125	Location 4	0.0070	NP	0.0079
Benzo[k]fluoranthene	H				0.018		22	9%	0.0125	Location 6	0.0068	NA	NA
Chrysene	H, C				0.018		22	27%	0.0503	Location 7	0.0121	NP	0.0242
Dibenzo[a,h]anthracene	H, C				0.018		22	14%	0.025	Location 6	0.0141	NP	0.0158
Fluoranthene	H		54		140		22	59%	10.4	Location 7	0.6263	NP	5.312
Fluorene	L				5300		22	59%	10.3	Location 17	1.134	NP	6.446
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	5%	0.0144	Location 17	0.0066	NA	NA
Naphthalene	L	620					22	73%	229	Location 5	13.323	NP	118
Phenanthrene	L						22	59%	6.4	Location 17	0.539	NP	3.735
Pyrene	H				4,000		22	68%	3.14	Location 7	0.2309	NP	1.663
Total LPAHs							22	91%	232	Location 5	18	NP	66
Total HPAHs							22	64%	13.6453	Location 7	0.890	NP	3.580
Total cPAHs			0.031				22	23%	0.1053	Location 7	0.0563	NP	0.0710
Total PAHs							22	91%	232	Location 5	19	Gamma	51

Please refer to notes at end of this table.

Table V-6: Summary of Sub-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Sub-Armoring Water Spring 2007						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration [1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	23	100%	0.0522	Location 3	0.0080	Gamma	0.0123
Chromium		0.21		0.074		0.1	23	30%	0.00255	Location 15	0.0006	NP	0.0022
Copper		0.012		0.009			23	96%	0.544	Location 15	0.0253	NP	0.2600
Zinc		0.11		0.12	26		23	57%	0.0526	Location 15	0.0098	NP	0.0350
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	23	0%	ND	NA	0.3854	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		23	78%	47.5	Location 8	8.431	Gamma	23.018
Acenaphthylene	L						23	13%	0.605	Location 16	0.0581	NP	0.3423
Anthracene	L				40,000		23	52%	1.32	Location 5	0.0938	NP	0.667
Benzo[a]anthracene	H, C				0.018		23	13%	0.3065	Location 5	0.0218	NP	0.0787
Benzo[a]pyrene	H, C				0.018	0.2	23	4%	0.3065	Location 5	0.0204	NA	NA
Benzo[b]fluoranthene	H, C				0.018		23	4%	0.3065	Location 5	0.0199	NA	NA
Benzo[g,h,i]perylene	H, C						23	4%	0.3065	Location 5	0.0202	NA	NA
Benzo[k]fluoranthene	H				0.018		23	4%	0.3065	Location 5	0.0200	NA	NA
Chrysene	H, C				0.018		23	13%	0.3065	Location 5	0.0222	NP	0.0790
Dibenzo[a,h]anthracene	H, C				0.018		23	4%	0.615	Location 5	0.0397	NA	NA
Fluoranthene	H		54		140		23	57%	2.75	Location 7	0.1935	NP	1.434
Fluorene	L				5300		23	65%	20.3	Location 5	1.903	NP	12.450
Ideno[1,2,3-cd]pyrene	H, C				0.018		23	4%	0.3065	Location 5	0.0205	NA	NA
Naphthalene	L	620					23	30%	848	Location 5	69.124	NP	150
Phenanthrene	L						23	39%	17	Location 5	0.990	NP	8.538
Pyrene	H				4,000		23	43%	1.31	Location 7	0.0895	NP	0.658
Total LPAHs							23	87%	928	Location 5	80	NP	160
Total HPAHs							23	57%	4.1375	Location 7	0.308	NP	1.090
Total cPAHs			0.031				23	13%	0.2105	Location 10	0.1789	NP	0.6910
Total PAHs							23	91%	929	Location 5	81	NP	161

Please refer to notes at end of this table.

Table V-6: Summary of Sub-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Sub-Armoring Water Fall 2007						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	100%	0.0322	Location 4	0.0126	Normal	0.0162
Chromium		0.21		0.074		0.1	22	9%	0.00143	Location 3	0.0003	NP	0.0006
Copper		0.012		0.009			22	86%	0.00476	Location 15	0.0008	NP	0.0018
Zinc		0.11		0.12	26		22	91%	0.0335	Location 16	0.0113	Gamma	0.0154
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	22	5%	3.27	Location 16	0.2621	NP	0.8864
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	59%	67.6	Location 9	10.814	Gamma	27.062
Acenaphthylene	L						22	0%	0.119	Location 6	0.0262	NP	0.0951
Anthracene	L				40,000		22	18%	1.14	Location 9	0.1284	NP	0.699
Benzo[a]anthracene	H, C				0.018		22	9%	0.153	Location 7	0.0140	NP	0.0434
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	0.00595	Location 4	0.0059	NP	0.0059
Benzo[b]fluoranthene	H, C				0.018		22	0%	0.00595	Location 4	0.0059	NP	0.0059
Benzo[g,h,i]perylene	H, C						22	0%	0.00595	Location 4	0.0059	NP	0.0059
Benzo[k]fluoranthene	H				0.018		22	5%	0.0128	Location 7	0.0062	NP	0.0068
Chrysene	H, C				0.018		22	18%	0.151	Location 7	0.0152	NP	0.0448
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	0.0119	Location 4	0.0119	NP	0.0119
Fluoranthene	H		54		140		22	36%	12.2	Location 7	0.6482	NP	6.132
Fluorene	L				5300		22	36%	25.5	Location 9	3.114	Max	25.500
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	0.00595	Location 4	0.0059	NP	0.0059
Naphthalene	L	620					22	18%	407	Location 16	24.132	NP	325
Phenanthrene	L						22	14%	14.4	Location 9	1.112	NP	8.217
Pyrene	H				4,000		22	36%	5.53	Location 7	0.3260	NP	2.810
Total LPAHs							22	59%	446	Location 16	39	Gamma	101
Total HPAHs							22	45%	18.0468	Location 7	1.015	NP	4.559
Total cPAHs			0.031				22	18%	0.1658	Location 7	0.0552	NP	0.0821
Total PAHs							22	73%	446	Location 16	40	Gamma	102

Please refer to notes at end of this table.

Table V-6: Summary of Sub-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Sub-Armoring Water Spring 2008						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	95%	0.0296	Location 9	0.0090	Gamma	0.0140
Chromium		0.21		0.074		0.1	22	55%	0.00122	Location 12	0.0003	NP	0.0011
Copper		0.012		0.009			22	45%	0.00421	Location 17	0.0007	NP	0.0029
Zinc		0.11		0.12	26		22	64%	0.0219	Location 2	0.0077	NP	0.0132
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.1200	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	73%	50.5	Location 9	7.034	Gamma	18.920
Acenaphthylene	L						22	18%	0.0647	Location 5	0.0255	NP	0.0927
Anthracene	L				40,000		22	50%	1.27	Location 9	0.1168	NP	0.723
Benzo[a]anthracene	H, C				0.018		22	9%	0.176	Location 16	0.0163	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	5%	0.0131	Location 16	0.0063	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	5%	0.0375	Location 16	0.0074	NA	NA
Benzo[g,h,i]perylene	H, C						22	5%	0.0437	Location 16	0.0077	NA	NA
Benzo[k]fluoranthene	H				0.018		22	5%	0.0458	Location 16	0.0078	NA	NA
Chrysene	H, C				0.018		22	9%	0.146	Location 16	0.0151	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0120	NA	NA
Fluoranthene	H		54		140		22	64%	2.16	Location 9	0.2574	NP	1.474
Fluorene	L				5300		22	64%	18.9	Location 9	2.199	NP	12.600
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0060	NA	NA
Naphthalene	L	620					22	41%	232	Location 5	12.168	NP	117
Phenanthrene	L						22	41%	13.1	Location 9	1.135	NP	7.508
Pyrene	H				4,000		22	59%	1.06	Location 9	0.1554	NP	0.815
Total LPAHs							22	77%	253	Location 5	23	NP	77
Total HPAHs							22	68%	3.3488	Location 9	0.453	NP	1.244
Total cPAHs			0.031				22	9%	0.4621	Location 16	0.0747	NA	NA
Total PAHs							22	86%	253	Location 5	23	Gamma	63

Please refer to notes at end of this table.

Table V-6: Summary of Sub-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Sub-Armoring Water Fall 2008						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							--	--	--	--	--	--	--
Total Suspended Solids (mg/L)							--	--	--	--	--	--	--
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	100%	0.0806	Location 5	0.0091	Gamma	0.0156
Chromium		0.21		0.074		0.1	22	64%	0.00577	Location 4	0.0008	Gamma	0.0012
Copper		0.012		0.009			22	86%	0.0135	Location 4	0.0021	Gamma	0.0033
Zinc		0.11		0.12	26		22	64%	0.0328	Location 4	0.0082	NP	0.0154
Dissolved Metals (mg/L)													
Arsenic													
Chromium													
Copper													
Zinc													
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.1192	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	59%	48	Location 12	7.814	NP	12.870
Acenaphthylene	L						22	5%	0.569	Location 12	0.0429	NA	NA
Anthracene	L				40,000		22	36%	1.52	Location 9	0.1369	NP	0.254
Benzo[a]anthracene	H, C				0.018		22	18%	0.0912	Location 9	0.0158	NP	0.0388
Benzo[a]pyrene	H, C				0.018	0.2	22	5%	0.0242	Location 8	0.0068	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	9%	0.0321	Location 8	0.0075	NA	NA
Benzo[g,h,i]perylene	H, C						22	14%	0.0267	Location 8	0.0076	Normal	0.0095
Benzo[k]fluoranthene	H				0.018		22	14%	0.0368	Location 8	0.0084	Normal	0.0112
Chrysene	H, C				0.018		22	18%	0.0986	Location 9	0.0173	NP	0.0420
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0119	NA	NA
Fluoranthene	H		54		140		22	41%	2.19	Location 9	0.2399	NP	0.428
Fluorene	L				5300		22	55%	17.7	Location 9	2.632	NP	4.346
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	5%	0.0202	Location 8	0.0066	NA	NA
Naphthalene	L	620					22	55%	83.5	Location 9	4.793	NP	11
Phenanthrene	L						22	36%	13.7	Location 9	1.205	NP	2.337
Pyrene	H				4,000		22	36%	1.39	Location 9	0.1517	NP	0.271
Total LPAHs							22	64%	157	Location 9	17	NP	51
Total HPAHs							22	41%	3.8	Location 9	0.455	NP	1.338
Total cPAHs			0.031				22	18%	0.218	Location 9	0.0760	NP	0.1260
Total PAHs							22	68%	161	Location 9	17	NP	52

Please refer to notes at end of this table.

Table V-6: Summary of Sub-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Sub-Armoring Water Spring 2009						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							22	1	6700	Location 11	449	NP	1754
Total Suspended Solids (mg/L)							22	0.91	220	Location 11	35	Lognormal	95.61
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	100%	0.057	Location 5	0.0080	Gamma	0.0139
Chromium		0.21		0.074		0.1	22	95%	0.01	Location 16	0.0015	Lognormal	0.0031
Copper		0.012		0.009			22	73%	0.019	Location 16	0.0026	Gamma	0.0042
Zinc		0.11		0.12	26		22	27%	0.081	Location 11	0.0101	NP	0.0264
Dissolved Metals (mg/L)													
Arsenic							22	100%	0.057	Location 5	0.0078	Gamma	0.0141
Chromium							22	68%	0.0016	Location 15	0.0003	Gamma	0.0004
Copper							22	32%	0.003	Location 15	0.0007	NP	0.0014
Zinc							22	9%	0.0086	Location 3	0.0038	NA	NA
Pentachlorophenol (mg/L)		13		15	3	1	22	5%	0.74	Location 5	0.1868	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	55%	19	Location 5	2.282	NP	7.418
Acenaphthylene	L						22	14%	0.35	Location 12	0.0268	NP	0.0990
Anthracene	L				40,000		22	23%	0.22	Location 5	0.0259	NP	0.076
Benzo[a]anthracene	H, C				0.018		22	14%	0.066	Location 11	0.0091	NP	0.0218
Benzo[a]pyrene	H, C				0.018	0.2	22	5%	0.013	Location 4	0.0051	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	9%	0.07	Location 11	0.0084	NA	NA
Benzo[g,h,i]perylene	H, C						22	5%	0.028	Location 11	0.0058	NA	NA
Benzo[k]fluoranthene	H				0.018		22	9%	0.026	Location 11	0.0063	NA	NA
Chrysene	H, C				0.018		22	14%	0.077	Location 11	0.0098	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	0.00485	Location 6	0.0048	NA	NA
Fluoranthene	H		54		140		22	32%	0.79	Location 7	0.0633	NP	0.223
Fluorene	L				5300		22	68%	10	Location 5	0.808	NP	5.610
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	5%	0.03	Location 11	0.0059	NA	NA
Naphthalene	L	620					22	41%	0.2	Location 2	0.030	NP	0
Phenanthrene	L						22	50%	1.2	Location 5	0.085	NP	0.322
Pyrene	H				4,000		22	27%	0.49	Location 7	0.0440	NP	0.145
Total LPAHs							22	86%	31	Location 5	3	NP	20
Total HPAHs							22	32%	1.328	Location 7	0.153	NP	0.434
Total cPAHs			0.031				22	14%	0.297	Location 11	0.0528	NP	0.1050
Total PAHs							22	86%	31	Location 5	3	Lognormal	9

Please refer to notes at end of this table.

Table V-6: Summary of Sub-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Sub-Armoring Water Fall 2009						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	Number of Samples	Detection Frequency	Max Detection	Max Location	Mean Concentration[1]	Data Distribution	95% UCL Value[1]
Total Dissolved Solids (mg/L)							22	1	1110	Location 16	256.6818182	Lognormal	391.7
Total Suspended Solids (mg/L)							22	1	615	Location 16	189.4590909	Gamma	298.3
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	95%	0.0451	Location 04	0.0093	Gamma	0.0145
Chromium		0.21		0.074		0.1	22	50%	0.0022	Location 18	0.0005	NP	0.0010
Copper		0.012		0.009			22	95%	0.007	Location 02	0.0018	Gamma	0.0026
Zinc		0.11		0.12	26		22	73%	0.0379	Location 18	0.0075	Gamma	0.0111
Dissolved Metals (mg/L)													
Arsenic							22	100%	0.0439	Location 04	0.0097	Gamma	0.0155
Chromium							22	32%	0.00036	Location 14	0.0002	NP	0.0002
Copper							22	41%	0.0022	Location 02	0.0005	NP	0.0007
Zinc							22	27%	0.0075	Location 02	0.0024	NP	0.0044
Pentachlorophenol (mg/L)		13		15	3	1	22	0%	ND	NA	0.0003	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	82%	45.1	Location 16	6.153	Gamma	16.200
Acenaphthylene	L						22	27%	0.28	Location 12	0.0308	NP	0.0511
Anthracene	L				40,000		22	27%	0.58	Location 09	0.0582	NP	0.105
Benzo[a]anthracene	H, C				0.018		22	9%	0.024	Location 17	0.0086	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	0%	ND	NA	0.0075	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	9%	0.021	Location 13	0.0087	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0075	NA	NA
Benzo[k]fluoranthene	H				0.018		22	0%	ND	NA	0.0075	NA	NA
Chrysene	H, C				0.018		22	9%	0.038	Location 07	0.0095	NA	NA
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0075	NA	NA
Fluoranthene	H		54		140		22	41%	1.4	Location 07	0.1200	NP	0.227
Fluorene	L				5300		22	64%	13	Location 09	1.733	NP	3.006
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0075	NA	NA
Naphthalene	L	620					22	45%	0.93	Location 16	0.156	NP	0
Phenanthrene	L						22	32%	3.5	Location 09	0.354	NP	0.677
Pyrene	H				4,000		22	41%	0.79	Location 07	0.0733	NP	0.132
Total LPAHs							22	86%	52	Location 16	8	Gamma	22
Total HPAHs							22	55%	2.228	Location 07	0.208	NP	0.393
Total cPAHs			0.031				22	18%	0.082	Location 13	0.0330	Student's T	0.0617
Total PAHs							22	86%	53	Location 16	9	NP	14

Please refer to notes at end of this table.

Table V-6: Summary of Sub-Armoring Water Data
McCormick & Baxter Superfund Site
Portland, Oregon

Constituent of Interest		McCormick & Baxter Record of Decision, 1996, Ambient Water Quality Criteria		EPA Current, 2007, National Recommended Water Quality Criteria		EPA National Primary Drinking Water Regulations	Sub-Armoring Water Spring 2010						
		Aquatic Life (chronic)[2]	Human Health (fish consumption only)[2]	Aquatic Life (chronic)[3]	Human Health (consumption of organism only)[3]	Maximum Contaminant Levels (MCLs)[4]	**Number of Samples**	**Detection Frequency**	**Max Detection**	**Max Location**	**Mean Concentration[1]**	**Data Distribution**	**95% UCL Value[1]**
Total Dissolved Solids (mg/L)							22	1	899	Location 05	233.2727273	Gamma	317.5
Total Suspended Solids (mg/L)							22	0.954545455	592	Location 16	105.6022727	Gamma	578.8
Total Metals (mg/L)													
Arsenic		0.19		0.15	0.00014	0.01	22	100%	0.036	Location 02	0.0073	Gamma	0.0115
Chromium		0.21		0.074		0.1	22	59%	0.0061	Location 14	0.0009	Nonparametric	0.0021
Copper		0.012		0.009			22	68%	0.0095	Location 14	0.0017	Gamma	0.0030
Zinc		0.11		0.12	26		22	91%	0.0232	Location 14	0.0069	Gamma	0.0096
Dissolved Metals (mg/L)													
Arsenic							22	100%	0.0354	Location 02	0.0071	Gamma	0.0115
Chromium							22	45%	0.00043	Location 19	0.0002	Normal	0.0002
Copper							22	68%	0.0023	Location 03	0.0005	Gamma	0.0007
Zinc							22	100%	0.0157	Location 07	0.0041	Gamma	0.0054
Pentachlorophenol (mg/L)		13		15	3	1	22	5%	0.32	Location 19	0.0850	NA	NA
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/L)													
Acenaphthene	L	520			990		22	68%	61.5	Location 12	6.601	Nonparametric	28.100
Acenaphthylene	L						22	18%	0.4	Location 12	0.0365	Nonparametric	0.1310
Anthracene	L				40,000		22	36%	0.16	Location 12	0.0174	Nonparametric	0.049
Benzo[a]anthracene	H, C				0.018		22	9%	0.03	Location 12	0.0039	NA	NA
Benzo[a]pyrene	H, C				0.018	0.2	22	5%	0.015	Location 21	0.0022	NA	NA
Benzo[b]fluoranthene	H, C				0.018		22	9%	0.03	Location 21	0.0048	NA	NA
Benzo[g,h,i]perylene	H, C						22	0%	ND	NA	0.0011	NA	NA
Benzo[k]fluoranthene	H				0.018		22	9%	0.014	Location 12	0.0037	NA	NA
Chrysene	H, C				0.018		22	14%	0.025	Location 21	0.0041	Nonparametric	0.0106
Dibenzo[a,h]anthracene	H, C				0.018		22	0%	ND	NA	0.0021	NA	NA
Fluoranthene	H		54		140		22	50%	0.46	Location 08	0.0522	Nonparametric	0.146
Fluorene	L				5300		22	68%	12.9	Location 12	1.327	Gamma	3.567
Ideno[1,2,3-cd]pyrene	H, C				0.018		22	0%	ND	NA	0.0021	NA	NA
Naphthalene	L	620					22	32%	16.1	Location 17	1.744	Nonparametric	6
Phenanthrene	L						22	41%	10.4	Location 07	0.528	Nonparametric	2.580
Pyrene	H				4,000		22	55%	0.24	Location 08	0.0367	Nonparametric	0.089
Total LPAHs							22	77%	76	Location 12	10	Gamma	26
Total HPAHs							22	55%	0.7	Location 08	0.104	Nonparametric	0.251
Total cPAHs			0.031				22	14%	0.109	Location 21	0.0229	Nonparametric	0.0461
Total PAHs							22	82%	77	Location 12	10	Gamma	25

Please refer to notes at end of this table.

Table V-6: Summary of Sub-Armoring Water Data

McCormick & Baxter Superfund Site
Portland, Oregon

Notes:

[1]The number of significant figures presented in the table do not reflect the true accuracy presented by the laboratory results. Data should only retain 3 significant figures. Due to statistical evaluation using Microsoft Excel, additional significant figures may be shown.

[2] The 1996 Record of Decision (ROD) specifies the remedial action objectives of the sediment cap as: 1) preventing human and aquatic organisms from direct contact with contaminated sediment; and 2) minimizing releases of contaminants from sediment that might result in contamination of the Willamette River in excess Ambient Water Quality Criteria (AWQCs).

[3] National Recommended Water Quality Criteria (NRWQCs) published as of August 15, 2007, are included for comparison (see http://water.epa.gov/scitech/swguidance/standards/current/index.cfm).

[4] National Primary Drinking Water Regulations Maximum Contaminant Levels (MCLs) promulgated as of August 15, 2007, are included for comparison (see http://water.epa.gov/drink/contaminants/index.cfm).

Key:

C = carcinogenic PAH (cPAH)
Gamma = gamma distribution
H = high molecular weight PAH (HPAH)
J = estimated value
L = low molecular weight PAH (LPAH)
µg/L = micrograms per liter
mg/L = milligrams per liter
MRL = method reporting limit
NA= not applicable
ND = not detected
NP = nonparametric distribution
U = value below MDL (value represents MDL)

Table V-7: Comparison Criteria Exceedance Summary 2005 - 2010
McCormick & Baxter Superfund Site
Portland, Oregon

Analyte	Comparison Criteria[1]	2005			
		Surface Water		Sub-armoring Water	
		Total Exceedances	Sampling Location	Total Exceedances	Sampling Location
Total Arsenic	0.00014 mg/L	25	All	25	All
Total Chromium	0.074 mg/L				
Total Copper	0.009 mg/L			1	9
Total Zinc	0.11 mg/L			1	9
PCP	1 µg/L				
Acenaphthene	520 µg/L				
Anthracene	40,000 µg/L				
Benz (a) anthracene	0.018 µg/L			4	7, 9, 20, 26
Benzo (a) pyrene	0.02 µg/L			1	9
Benzo (b) fluoranthene	0.018 µg/L			1	9
Benzo (k) fluoranthene	0.018 µg/L			1	9
Chrysene	0.018 µg/L			3	9, 20, 26
Dibenz (a,h) anthracene	0.018 µg/L				
Fluoranthene	54 µg/L				
Fluorene	5,300 µg/L				
Indeno (1,2,3-cd) pyrene	0.018 µg/L				
Naphthalene	620 µg/L			2	9, 10
Pyrene	4,000 µg/L				
Total CPAHs	0.031 µg/L			4	7, 9, 20, 26
Total AWQC Exceedances		25		43	

Analyte	Comparison Criteria[1]	Spring 2006						Fall 2006					
		Surface Water		Inter-armoring Water		Sub-armoring Water		Surface Water		Inter-armoring Water		Sub-armoring Water	
		Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location
Total Arsenic	0.00014 mg/L	6	4, 15, 24, 25, 27	7	5, 7, 12, 13, 17, 20, 25	20	Multiple	23	Multiple	22		22	Multiple
Total Chromium	0.074 mg/L												
Total Copper	0.009 mg/L	3	9, 18, 27	1	12	4	11, 14, 15, 19						
Total Zinc	0.11 mg/L												
PCP	1 µg/L												
Acenaphthene	520 µg/L												
Anthracene	40,000 µg/L												
Benz (a) anthracene	0.018 µg/L					3	5, 7, 9,			1	5		
Benzo (a) pyrene	0.02 µg/L					1	5						
Benzo (b) fluoranthene	0.018 µg/L					2	5, 9						
Benzo (k) fluoranthene	0.018 µg/L												
Chrysene	0.018 µg/L	1	25	1	5	3	5, 9, 11			1	5		
Dibenz (a,h) anthracene	0.018 µg/L												
Fluoranthene	54 µg/L												
Fluorene	5,300 µg/L												
Indeno (1,2,3-cd) pyrene	0.018 µg/L												
Naphthalene	620 µg/L					1	16						
Pyrene	4,000 µg/L												
Total CPAHs	0.031 µg/L	1	13	1	5	5	5, 7, 9, 10, 11			1	5	4	7, 9, 10, 17
Total AWQC Exceedances		11		10		39		23		25			

Table V-7: Comparison Criteria Exceedance Summary 2005 - 2010
McCormick & Baxter Superfund Site
Portland, Oregon

Analyte	Comparison Criteria[1]	Spring 2007						Fall 2007					
		Surface Water		Inter-armoring Water		Sub-armoring Water		Surface Water		Inter-armoring Water		Sub-armoring Water	
		Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location
Total Arsenic	0.00014 mg/L	25	All	3	3, 5, 21	23	All	12	Multiple	18	Multiple	22	All
Total Chromium	0.074 mg/L												
Total Copper	0.009 mg/L			4	4, 5, 6, 21	2	12, 15						
Total Zinc	0.11 mg/L												
PCP	1 µg/L											1	16
Acenaphthene	520 µg/L												
Anthracene	40,000 µg/L												
Benz (a) anthracene	0.018 µg/L					2	7, 12					2	7, 10
Benzo (a) pyrene	0.02 µg/L					1	10						
Benzo (b) fluoranthene	0.018 µg/L					1	10						
Benzo (k) fluoranthene	0.018 µg/L					1	10						
Chrysene	0.018 µg/L					3	7, 10, 13					2	7, 10
Dibenz (a,h) anthracene	0.018 µg/L					1	10						
Fluoranthene	54 µg/L												
Fluorene	5,300 µg/L												
Indeno (1,2,3-cd) pyrene	0.018 µg/L					1	10						
Naphthalene	620 µg/L					1	5						
Pyrene	4,000 µg/L												
Total CPAHs	0.031 µg/L					3	7, 10, 13					2	7,10
Total AWQC Exceedances		25		7		39		12		18		29	

Analyte	Comparison Criteria[1]	Spring 2008						Fall 2008					
		Surface Water		Inter-armoring Water		Sub-armoring Water		Surface Water		Inter-armoring Water		Sub-armoring Water	
		Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location
Total Arsenic	0.00014 mg/L			1	14	21	All but 15	22	Multiple	21	All but 20		
Total Chromium	0.074 mg/L												
Total Copper	0.009 mg/L									2	5, 14	1	4
Total Zinc	0.11 mg/L			1	9								
PCP	1 µg/L												
Acenaphthene	520 µg/L												
Anthracene	40,000 µg/L												
Benz (a) anthracene	0.018 µg/L					2	9, 16					3	6, 7, 8
Benzo (a) pyrene	0.02 µg/L					1	16					1	8
Benzo (b) fluoranthene	0.018 µg/L					1	16					2	6, 8
Benzo (k) fluoranthene	0.018 µg/L					1	16					1	8
Chrysene	0.018 µg/L					2	9, 16					4	6, 7, 8, 9
Dibenz (a,h) anthracene	0.018 µg/L												
Fluoranthene	54 µg/L												
Fluorene	5,300 µg/L												
Indeno (1,2,3-cd) pyrene	0.018 µg/L											1	8
Naphthalene	620 µg/L												
Pyrene	4,000 µg/L												
Total CPAHs	0.031 µg/L						9, 16						
Total AWQC Exceedances				2		28		22		23		13	

Table V-7: Comparison Criteria Exceedance Summary 2005 - 2010
McCormick & Baxter Superfund Site
Portland, Oregon

Analyte	Comparison Criteria[1]	Spring 2009						Fall 2009					
		Surface Water		Inter-armoring Water		Sub-armoring Water		Surface Water		Inter-armoring Water		Sub-armoring Water	
		Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location
Total Arsenic	0.00014 mg/L	24	All	22	All	22	All	18	Multiple	17	Multiple	21	Multiple
Total Chromium	0.074 mg/L												
Total Copper	0.009 mg/L	1	19	1	17	2	11, 16			1	4		
Total Zinc	0.11 mg/L												
PCP	1 µg/L												
Acenaphthene	520 µg/L												
Anthracene	40,000 µg/L												
Benz (a) anthracene	0.018 µg/L					3	4, 7, 11					1	17
Benzo (a) pyrene	0.02 µg/L												
Benzo (b) fluoranthene	0.018 µg/L					2	4, 11					2	13, 16
Benzo (k) fluoranthene	0.018 µg/L					1	11						
Chrysene	0.018 µg/L					3	4, 7, 11					2	7, 17
Dibenz (a,h) anthracene	0.018 µg/L												
Fluoranthene	54 µg/L												
Fluorene	5,300 µg/L												
Indeno (1,2,3-cd) pyrene	0.018 µg/L												
Naphthalene	620 µg/L												
Pyrene	4,000 µg/L												
Total CPAHs	0.031 µg/L	1	15			3	4, 7, 11					4	7, 13, 16, 17
Total AWQC Exceedances		26		23		36		18		18		30	

Analyte	Comparison Criteria[1]	Spring 2010					
		Surface Water		Inter-armoring Water		Sub-armoring Water	
		Total Exceedances	Sampling Location	Total Exceedances	Sampling Location	Total Exceedances	Sampling Location
Total Arsenic	0.00014 mg/L	24	All	22	All	22	All
Total Chromium	0.074 mg/L						
Total Copper	0.009 mg/L			4	6,7,10,15,	1	14
Total Zinc	0.11 mg/L			1	6		
PCP	1 µg/L						
Acenaphthene	520 µg/L						
Anthracene	40,000 µg/L						
Benz (a) anthracene	0.018 µg/L					2	12, 21
Benzo (a) pyrene	0.02 µg/L						
Benzo (b) fluoranthene	0.018 µg/L					2	12, 21
Benzo (k) fluoranthene	0.018 µg/L						
Chrysene	0.018 µg/L					2	12, 21
Dibenz (a,h) anthracene	0.018 µg/L						
Fluoranthene	54 µg/L						
Fluorene	5,300 µg/L						
Indeno (1,2,3-cd) pyrene	0.018 µg/L						
Naphthalene	620 µg/L						
Pyrene	4,000 µg/L						
Total cPAHs	0.031 µg/L					2	12, 21
Total AWQC Exceedances		24		27		31	

Notes:
[1]Most conservative values from AWQCs, NRWQCs, and NPDWRs

AWQCs = Ambient Water Quality Criteria (1996)
µg/L = micrograms per liter
mg/L = milligrams per liter
NPDWRs = National Primary Drinking Water Regulations
NRWQCs = National Recommended Water Quality Criteria
PCP = Pentachlorophenol
cPAH = Carcinogenic Polynuclear Aromatic Hydrocarbons

Table V-8: Maximum Concentration Summary

McCormick & Baxter Superfund Site
Portland, Oregon

Sampling Event	Maximum Detected Concentration											
	2002	2003	2005	Spring 2006	Fall 2006	Spring 2007	Fall 2007	Spring 2008	Fall 2008	Spring 2009	Fall 2009	Spring 2010
Surface Water												
Total Arsenic mg/L	0.001	0.002	0.001	0.002	0.007	0.0004	0.001	ND	0.0013	0.0018	0.0007	0.001
Total Chromium mg/L	0.002	0.005	ND	0.005	0.002	0.002	0.001	0.00097	0.00257	0.00950	0.00046	0.00130
Total Copper mg/L	0.021	0.021	0.003	0.017	0.003	0.003	0.002	0.00283	0.00282	0.01500	0.00150	0.00250
Total Zinc mg/L	0.018	0.019	0.008	0.040	0.005	0.022	0.004	0.0125	0.0111	0.0320	0.0065	0.006
PCP µg/L	0.079	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.320
Acenaphthene µg/L	9.800	ND	0.097	ND	0.166	0.013	0.411	0.066	0.704	0.020	0.098	0.330
Fluoranthene µg/L	11.900	0.078	ND	0.040	0.014	0.013	0.027	ND	0.024	0.012	0.016	0.021
Naphthalene µg/L	3.300	ND	0.911	0.190	0.930	0.025	1.330	0.093	2.930	0.110	0.510	ND
Total CPAHs µg/L	4.220	0.101	ND	0.053	ND	ND	ND	ND	ND	0.060	ND	ND
Total PAHs µg/L	61.500	0.282	1.044	0.281	1.188	0.111	1.990	0.148	3.980	0.116	0.754	0.441
Inter-Armoring Water												
Arsenic mg/L	--	--	--	0.005	0.002	0.007	0.020	0.00078	0.00257	0.00710	0.00400	0.011
Chromium mg/L	--	--	--	0.011	0.002	0.023	0.005	0.002	0.011	0.004	0.003	0.047
Copper mg/L	--	--	--	0.017	0.004	0.037	0.009	0.005	0.024	0.009	0.010	0.075
Zinc mg/L	--	--	--	0.039	0.015	0.067	0.022	0.172	0.058	0.018	0.030	0.162
PCP µg/L	--	--	--	ND	0.250	ND	ND	ND	ND	0.165	ND	ND
Acenaphthene µg/L	--	--	--	3.650	1.810	0.115	ND	0.058	0.184	6.000	0.140	0.560
Fluoranthene µg/L	--	--	--	0.253	0.111	ND	0.017	ND	0.017	0.110	0.028	0.014
Naphthalene µg/L	--	--	--	1.130	2.080	ND	ND	0.052	ND	0.420	0.360	ND
Total cPAHs µg/L	--	--	--	0.032	0.056	ND	ND	ND	ND	0.024	ND	ND
Total PAHs µg/L	--	--	--	9.122	4.457	0.150	0.081	0.126	0.757	7.861	0.594	0.680
Sub-Armoring Water												
Arsenic mg/L	--	--	0.033	0.037	0.039	0.052	0.032	0.030	0.081	0.057	0.045	0.038
Chromium mg/L	--	--	0.014	0.017	0.001	0.003	0.001	0.001	0.006	0.010	0.002	0.006
Copper mg/L	--	--	0.028	0.035	0.003	0.544	0.005	0.004	0.014	0.019	0.007	0.010
Zinc mg/L	--	--	0.113	0.388	0.026	0.053	0.036	0.022	0.033	0.081	0.038	0.023
PCP µg/L	--	--	0.469	18.500	0.250	ND	3.270	ND	ND	0.740	ND	0.320
Acenaphthene µg/L	--	--	131.000	22.100	19.000	47.500	67.600	50.5	48.0	19.0	45.1	61.5
Fluoranthene µg/L	--	--	7.400	1.670	10.400	2.750	12.200	2.16	2.19	0.790	1.400	0.46
Naphthalene µg/L	--	--	772.000	726.000	229.000	848.000	407.000	232	5	0.200	0.930	16.10
Total CPAHs µg/L	--	--	3.017	0.322	0.105	0.211	0.166	0.462	0.218	0.297	0.082	0.109
Total PAHs µg/L	--	--	885.000	738.000	232.000	929.150	445.890	253	161	30.8	52.6	76.5

Notes:
mg/L = milligrams per liter
µg/L = micrograms per liter
PCP = Pentachlorophenol
PAH = Polynuclear Aromatic Hydrocarbons
CPAH = Carcinogenic Polynuclear Aromatic Hydrocarbons
ND = Not Detected
-- = Not Sampled

Table V-9: Detection Frequency Summary
McCormick & Baxter Superfund Site
Portland, Oregon

Sampling Event	Detection Frequency											
	2002	2003	2005	Spring 2006	Fall 2006	Spring 2007	Fall 2007	Spring 2008	Fall 2008	Spring 2009	Fall 2009	Spring 2010
Surface Water												
Total Arsenic	27%	81%	100%	22%	95%	100%	48%	0%	91%	100%	73%	100%
Total Chromium	33%	100%	0%	74%	52%	58%	52%	77%	36%	100%	45%	100%
Total Copper	100%	100%	81%	74%	100%	100%	88%	77%	100%	95%	100%	100%
Total Zinc	100%	100%	88%	87%	27%	35%	64%	9%	27%	23%	73%	95%
Total PAHs	60%	43%	19%	30%	23%	8%	68%	18%	14%	59%	27%	14%
Inter-Armoring Water												
Total Arsenic	--	--	--	30%	100%	13%	78%	5%	95%	100%	77%	100%
Total Chromium	--	--	--	43%	64%	17%	52%	91%	55%	100%	68%	100%
Total Copper	--	--	--	96%	100%	100%	83%	82%	100%	100%	100%	100%
Total Zinc	--	--	--	78%	45%	4%	60%	27%	77%	27%	100%	100%
Total PAHs	--	--	--	55%	41%	17%	35%	32%	18%	55%	45%	18%
Sub-Armoring Water												
Total Arsenic	--	--	100%	91%	95%	100%	100%	95%	100%	100%	95%	100%
Total Chromium	--	--	0%	78%	23%	28%	8%	55%	64%	95%	50%	59%
Total Copper	--	--	70%	70%	82%	96%	88%	45%	86%	73%	95%	68%
Total Zinc	--	--	100%	87%	50%	52%	92%	64%	64%	27%	73%	91%
Total PAHs	--	--	78%	91%	91%	88%	75%	86%	68%	86%	86%	82%

Notes:
PAHs = Polynuclear Aromatic Hydrocarbons
-- = Not Sampled

FIGURES

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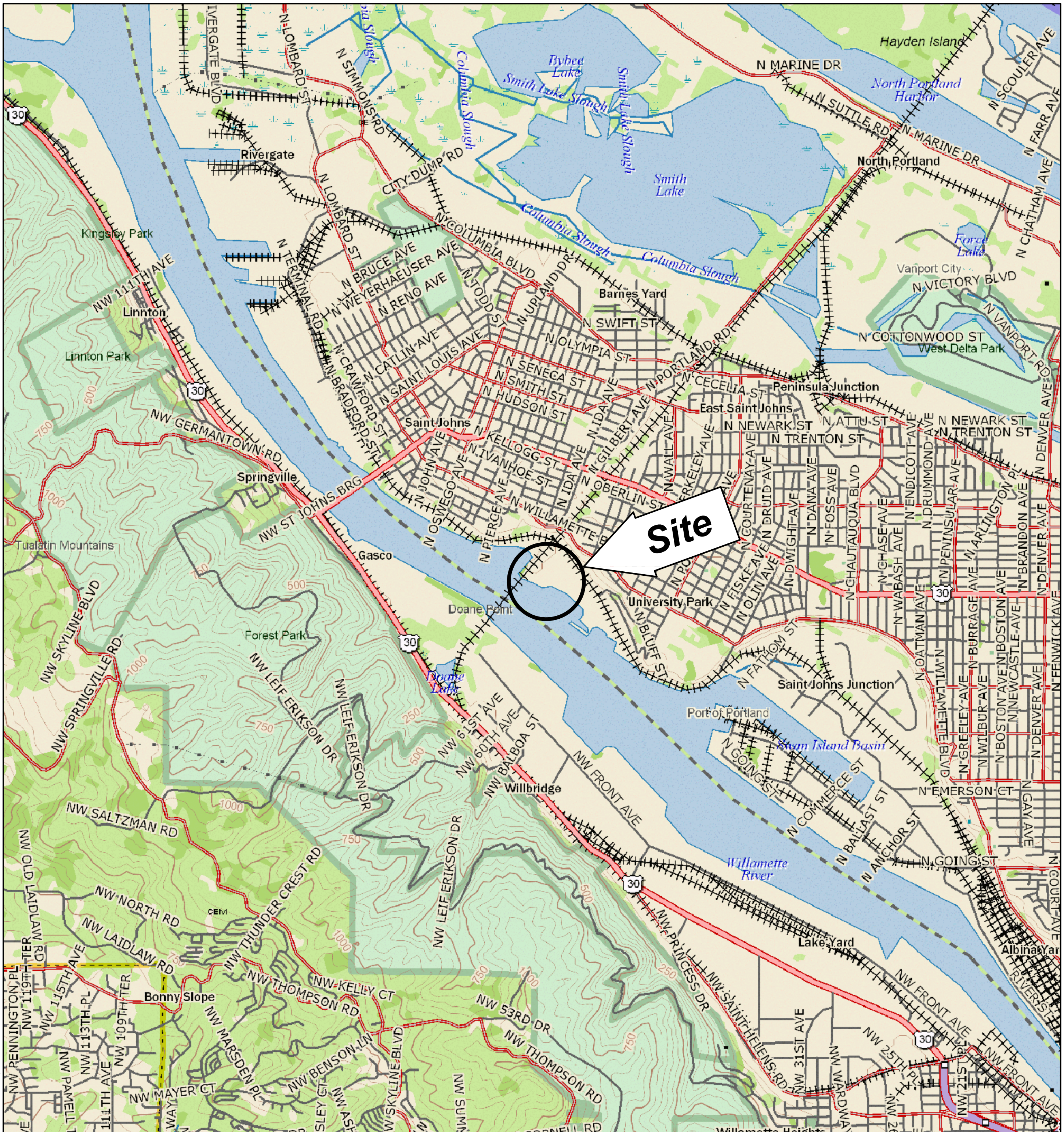

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McCormick & Baxter Superfund Site
land, Oregon

ite Location Map

9/11

Fı

III

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Sourc. .

LEGEND

- Subsurface Barrier Wall
- Sediment Cap Boundary
- Granular Organophilic Clay
- Organoclay™ Reactive Core Mats (Double)
- Organoclay™ Reactive Core Mats (Single)
- Thickened Sand Layer
- Boulder Clusters
- Riprap Armor
- Articulated Concrete Block
- 6-inch Minus Rock Armor
- 10-inch Minus Rock Armor
- Impermeable Cap
- Earthen Soil Cap Boundary

NOTE: Aerial photo taken on September 22, 2006

0 250 500

Scale in feet

McCormick & Baxter Superfund Site
Portland, Oregon

Current Site Layout and Features

9/11

HARTCROWSER GSI Water Solutions, Inc.

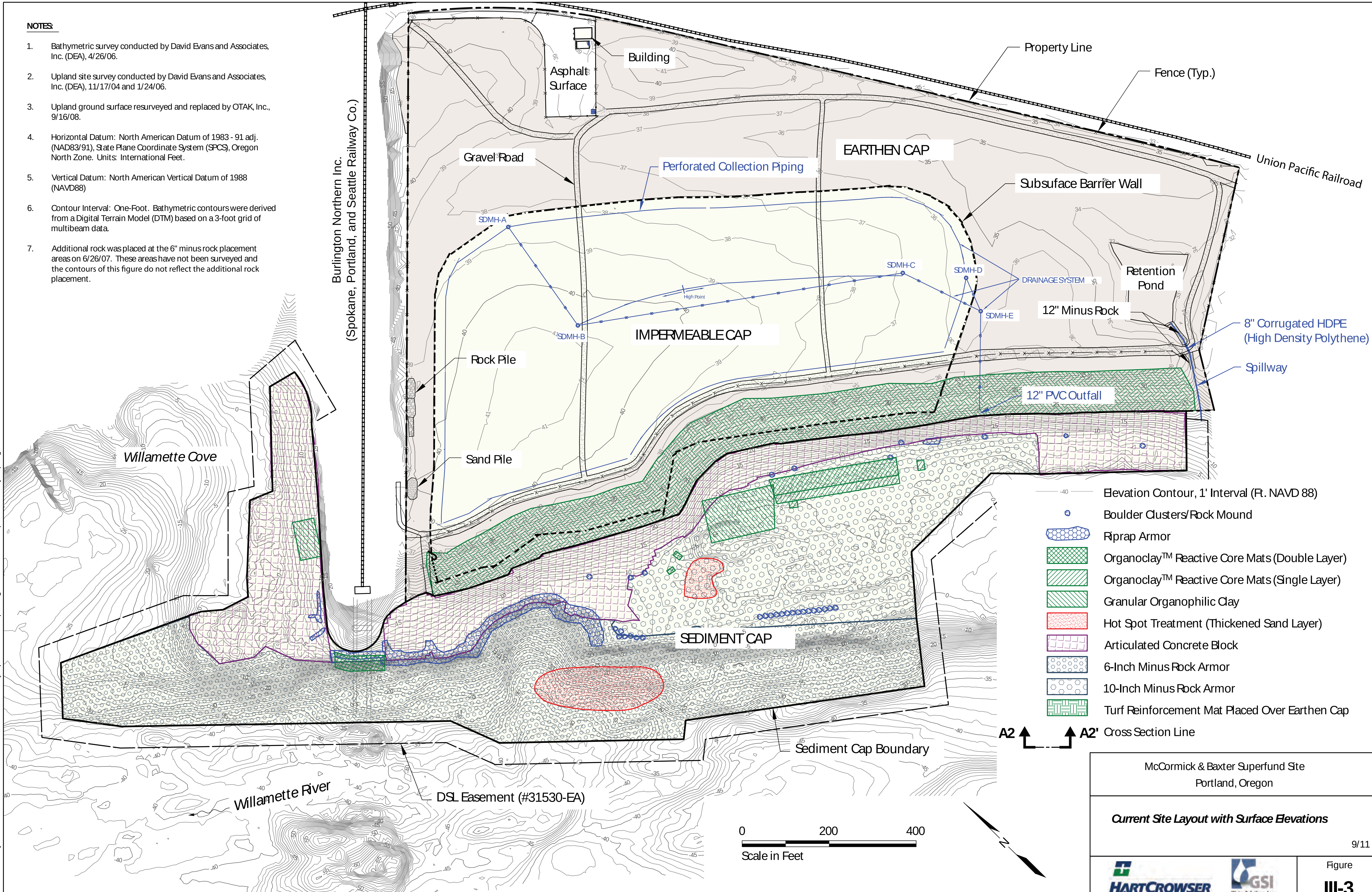
Figure

III-2

File Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project GIS\Project mxds\2011 Five Year Review\FigureIII 2 Current Site Layout and Features.mxd Date: September 21, 2011 9:15:56 AM

NOTES:

1. Bathymetric survey conducted by David Evans and Associates, Inc. (DEA), 4/26/06.
2. Upland site survey conducted by David Evans and Associates, Inc. (DEA), 11/17/04 and 1/24/06.
3. Upland ground surface resurveyed and replaced by OTAK, Inc., 9/16/08.
4. Horizontal Datum: North American Datum of 1983 - 91 adj. (NAD83/91), State Plane Coordinate System (SPCS), Oregon North Zone. Units: International Feet.
5. Vertical Datum: North American Vertical Datum of 1988 (NAVD88)
6. Contour Interval: One-Foot. Bathymetric contours were derived from a Digital Terrain Model (DTM) based on a 3-foot grid of multibeam data.
7. Additional rock was placed at the 6" minus rock placement areas on 6/26/07. These areas have not been surveyed and the contours of this figure do not reflect the additional rock placement.



McCormick & Baxter Superfund Site
Portland, Oregon

Current Site Layout with Surface Elevations

9/11

HARTCROWSER

GSI Water Solutions, Inc.

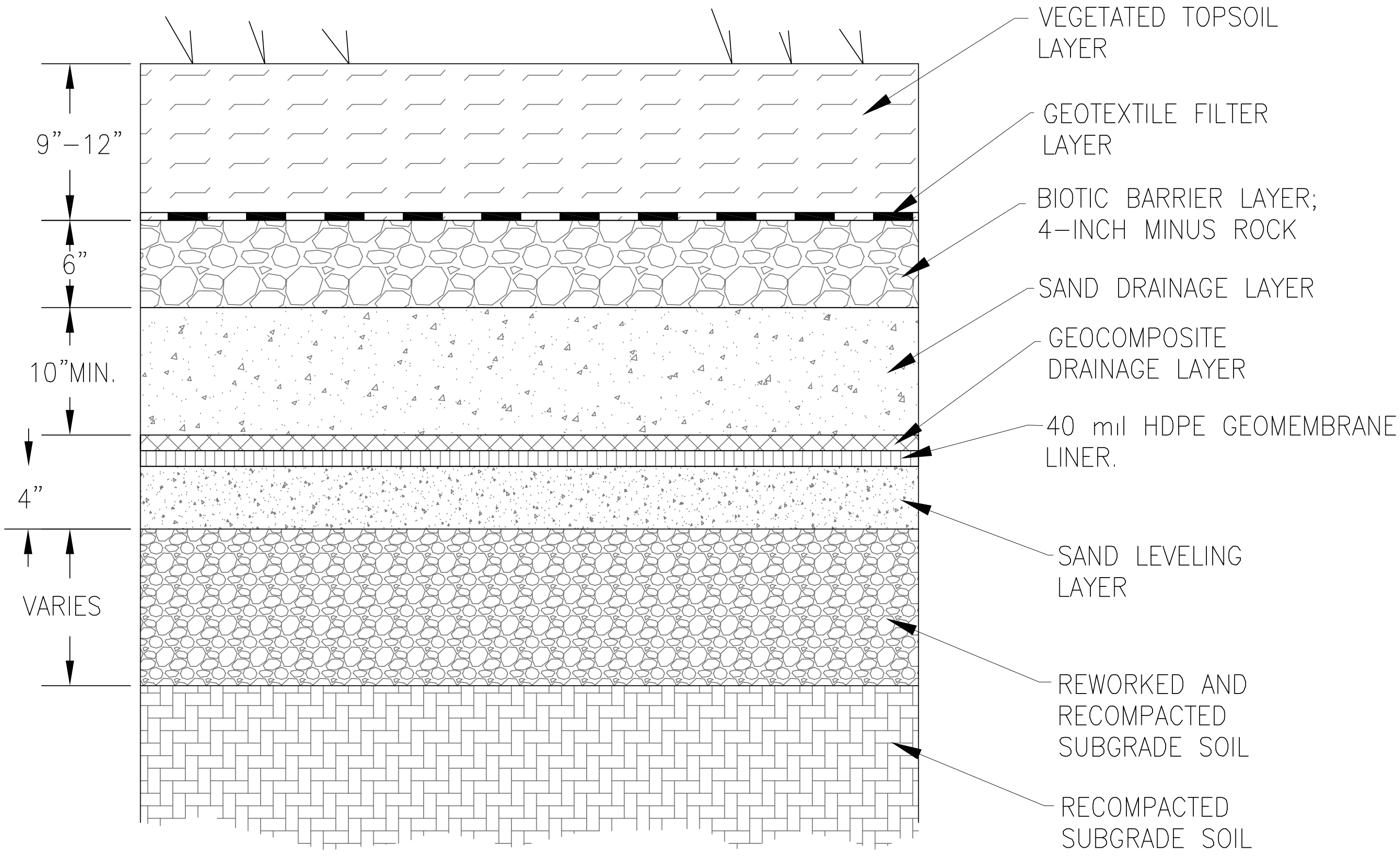
Figure
III-3

F:\Data\Jobs\DEQ\15670-xx M&B\15670-05 New O&F\Tk 10 O&M Plan & 5 yr Rpt\5 Year EPA Report\Figures\15670510-III-3 (Current Site Layout).dwg

FIGURE IV-1

Typical Impermeable Cap Section

McCormick & Baxter Superfund Site
Portland, Oregon



NOTE

Original drawing in Appendix J of the 2006 Annual Report (E&E, 2007).

Not to Scale

GSI Water Solutions, Inc.

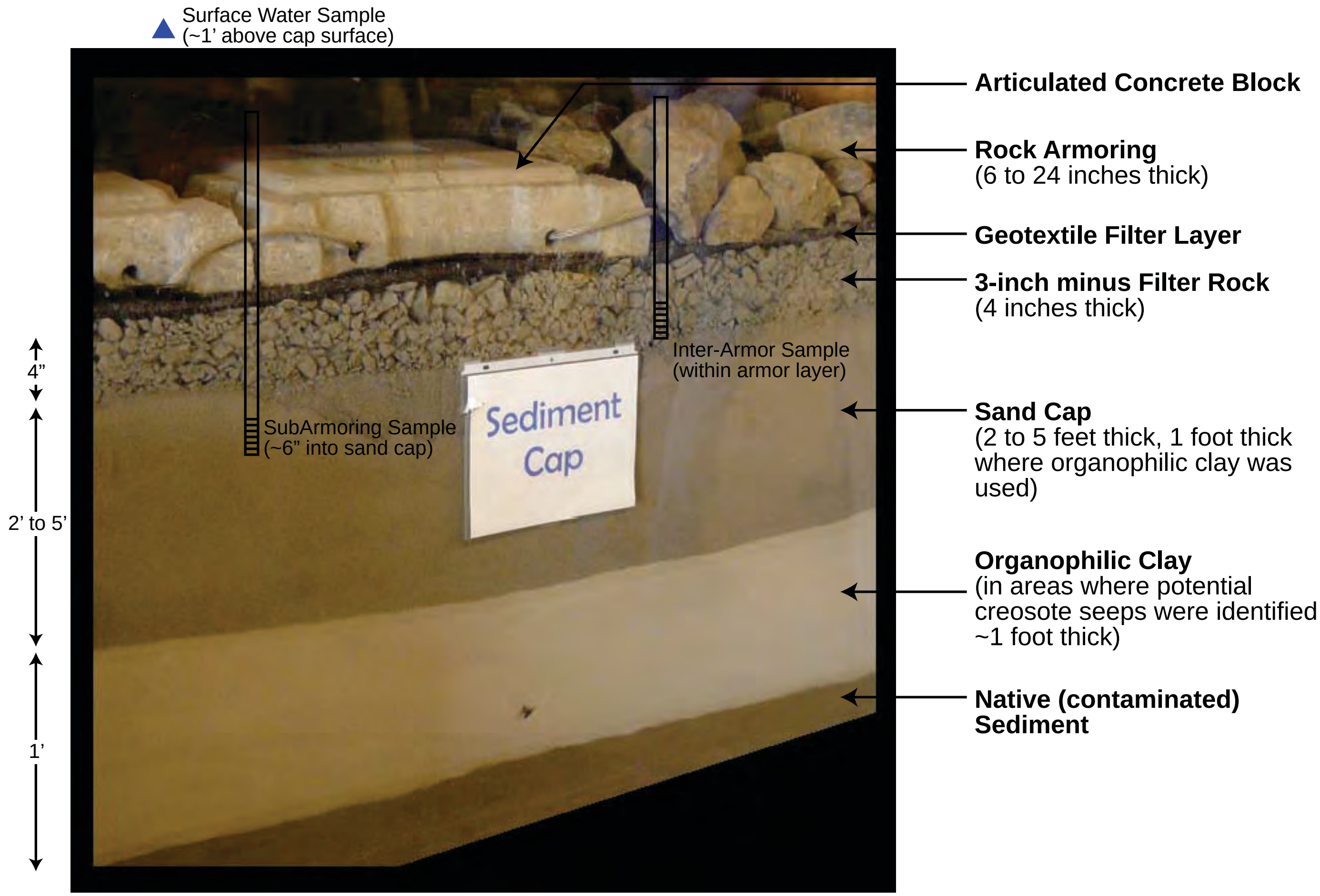


FIGURE IV-2

Typical Sediment Cap Section

McCormick & Baxter Superfund Site
Portland, Oregon

LEGEND

Surface Water Sample

Push Point Pore Water Sampler

Screen Interval

NOTE

Detailed sediment cap drawings in Appendix J of the 2006 Annual Report (E&E, 2007).

Not to Scale

GSI Water Solutions, Inc.

\\PDX\Projects\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Reviews\2011 Five-year Review\Drafts\Figures

LEGEND

Groundwater Monitoring Wells (Depth to LNAPL or DNAPL)

- Wells with LNAPL
- Wells with DNAPL
- Wells without LNAPL or DNAPL
- Subsurface Barrier Wall

NOTES:
1) Aerial photo taken on September 22, 2006.

0 200 400
Scale in feet

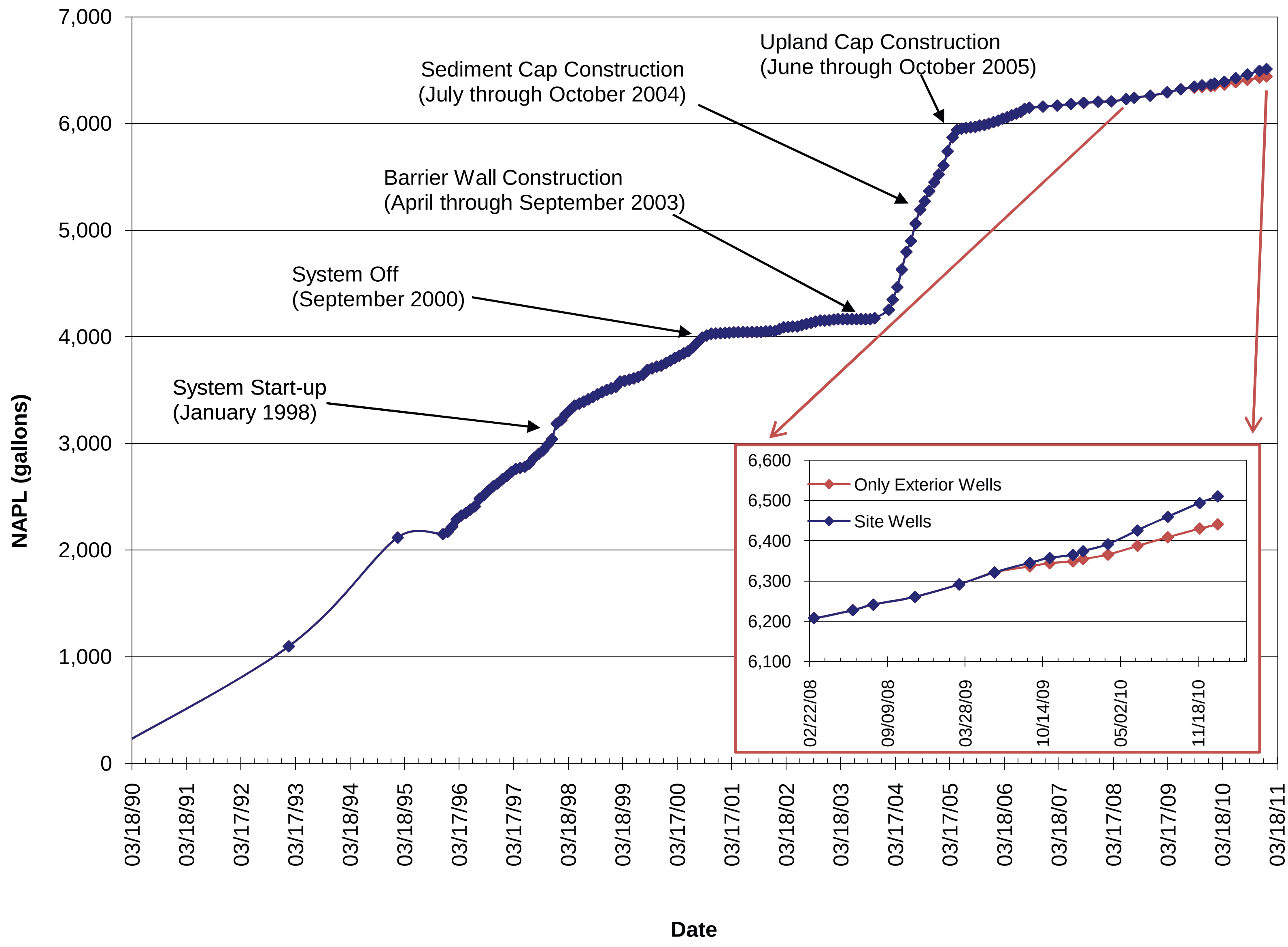
McCormick & Baxter Superfund Site
Portland, Oregon

LNAPL and DNAPL Distribution Map for 2006 - 2010

8/11

HARTCROWSER GSI Water Solutions, Inc.

Figure
V-1



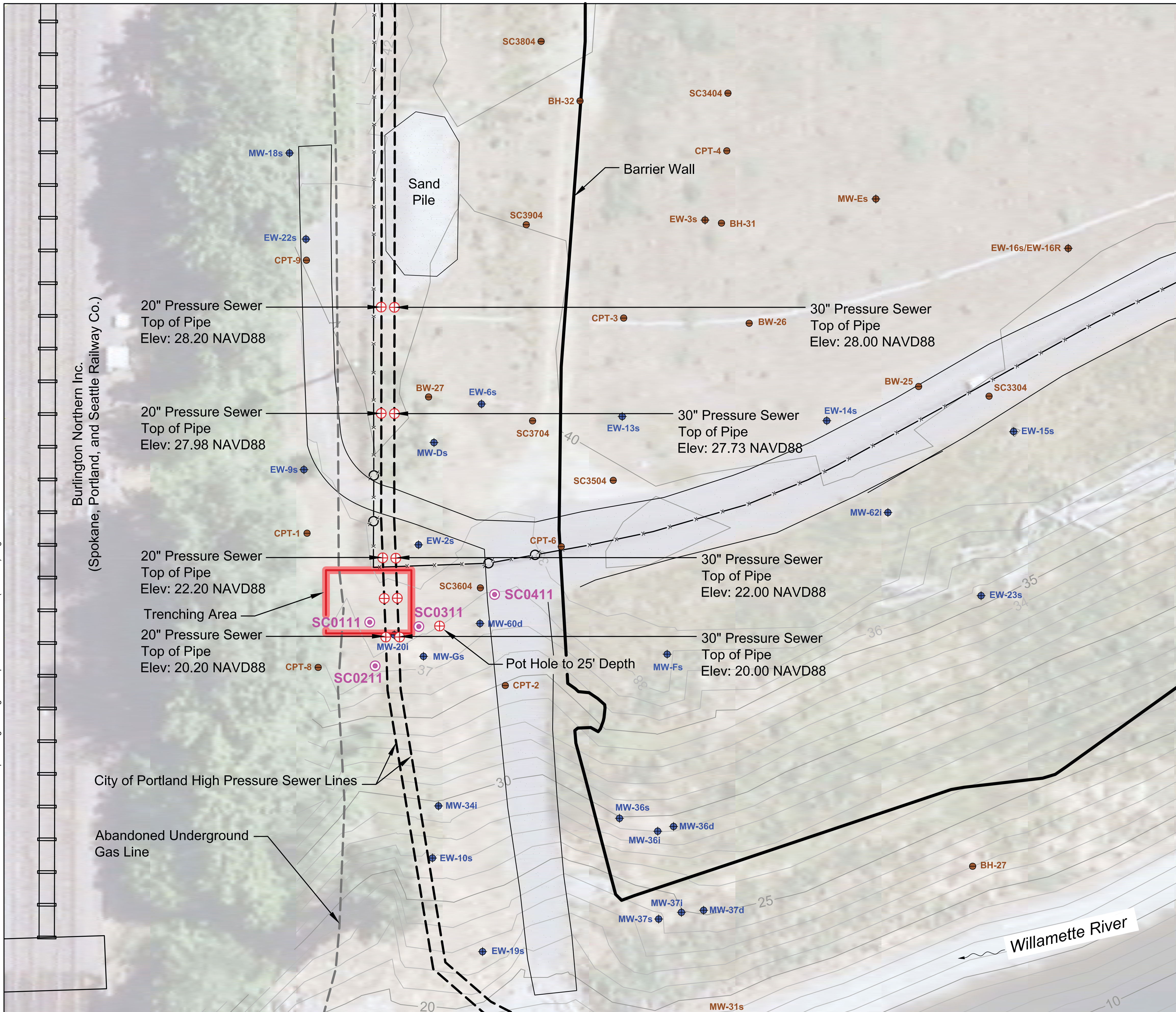
McCormick & Baxter Superfund Site
Portland, Oregon

Cumulative NAPL Recovery

1/2011

Figure

V-2



⊕ Vacuum Truck Pot Hole

SC0111 ◎ New Boring

EW-15s ⊕ Monitoring Well

EW-14s ⊕ Abandoned Monitoring Well

SC3304 ● Soil Boring

-40 Elevation Contour (Ft. NAVD 88)

Site Fence

City of Portland High Pressure Sewer Line

N

0 30 60

Scale in Feet

McCormick & Baxter Superfund Site
Portland, Oregon

DNAPL Data Gap Investigative Exploration Plan

6/11

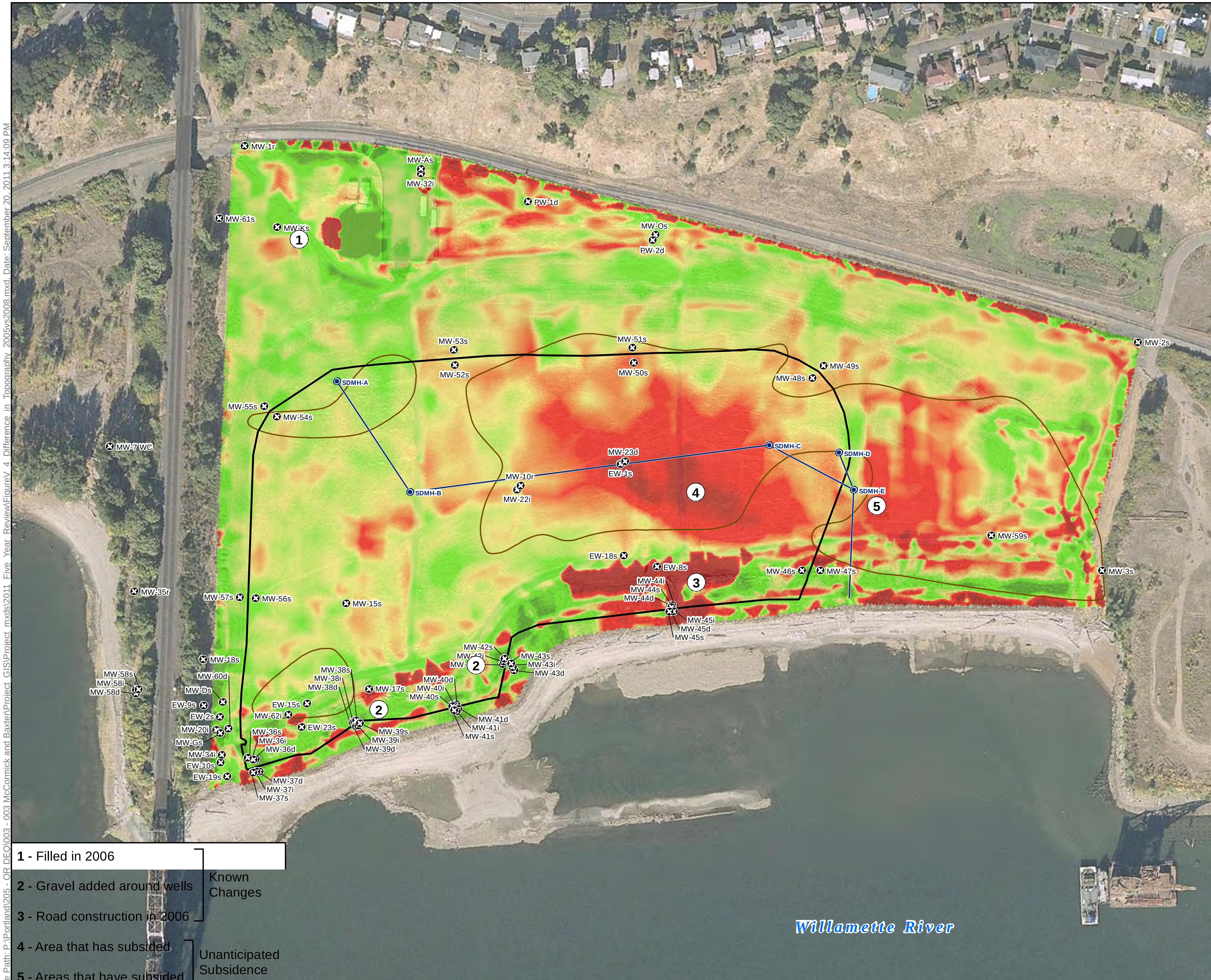
HARTCROWSER

GSI Water Solutions, Inc.

Figure

V-3

F:\DataJobs\DEQ\15670-xx M&B\15670-05 New O&F\TK 9 - Data Gap Investigation\Figure - Report\156700509-002 (Site Plan).dwg



LEGEND

Difference in Topography

-2 feet (Maximum Loss)

+2 feet (Maximum Gain)

Site Features

Groundwater Monitoring Wells

Stormwater Discharge Manhole

Stormwater Discharge Pipeline

Areas of Wood Debris

Subsurface Barrier Wall

NOTE: Aerial photo taken on September 22, 2006

0 200 400

Scale in feet

McCormick & Baxter Superfund Site
Portland, Oregon

Difference in Topography
Upland Cap Survey 2005 vs 2008

5/09

HARTCROWSER GSI Water Solutions, Inc.

Figure

V-4

File Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project GIS\Project_mxds\2011_Five_Year_Review\FigureV_4_Difference_in_Topography_2005vs2008.mxd, Date: September 20, 2011 3:14:09 PM

LEGEND

- Groundwater Monitoring Wells (Groundwater Elevation)
- Groundwater Elevation Contours (dashed where inferred)
- Willamette River Level During Sampling Event (14.90 feet)
- Subsurface Barrier Wall

NOTES:
1) All elevations shown exist in NAVD 88
2) Aerial photo taken on September 22, 2006
3) Water levels measured between 13:00 and 18:40
4) Willamette River low tide at 18:15 at 14.90 feet NAVD 88

0 200 400
Scale in feet

McCormick & Baxter Superfund Site
Portland, Oregon

Groundwater Contour Map for June 15, 2010

9/11

HARTCROWSER GSI Water Solutions, Inc.

Figure
V-5

File Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project GIS\Project mxds\2011 Five Year Review\FigureV 5 GW Contour Map June15 2010.mxd Date: September 20, 2011 3:15:37 PM

LEGEND

- Groundwater Monitoring Wells
- Infiltration Pond
- Subsurface Barrier Wall
- Drainage Swale Flow Direction Arrow

NOTE: Aerial photo taken on September 22, 2006

0 200 400

Scale in feet

McCormick & Baxter Superfund Site
Portland, Oregon

Groundwater Monitoring Well MW-59s and Infiltration Pond Location Map

8/11

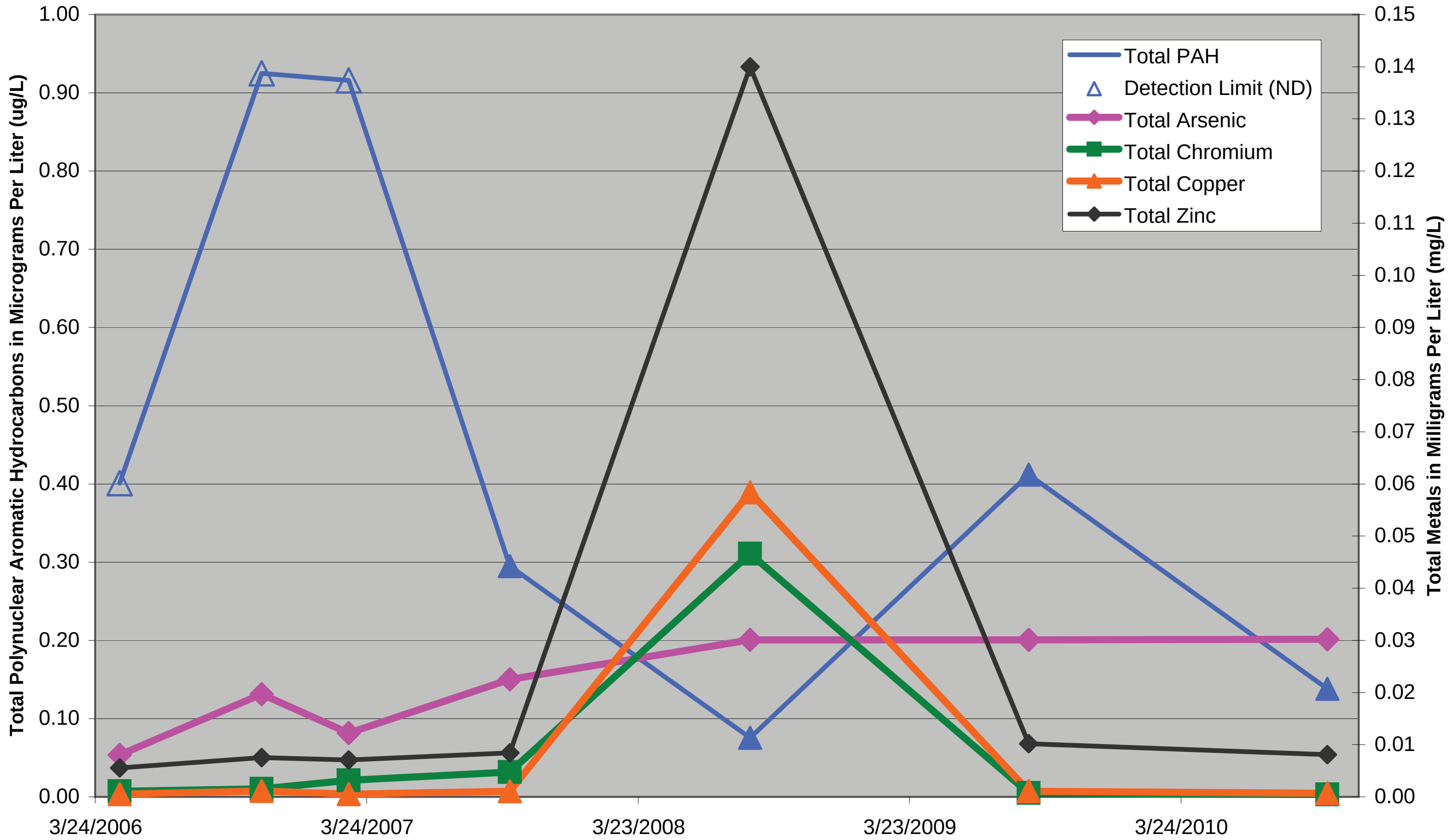
HARTCROWSER GSI Water Solutions, Inc.

Figure

V-6

File Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project GIS\Project_mxds\2011_Five_Year_Review\FigureV_6_GW_Monitoring_Well_MW-59s_Location_Map.mxd, Date: September 20, 2011 3:17:10 PM

JAB 12/28/10 FigureE-2_GW Quality.xls



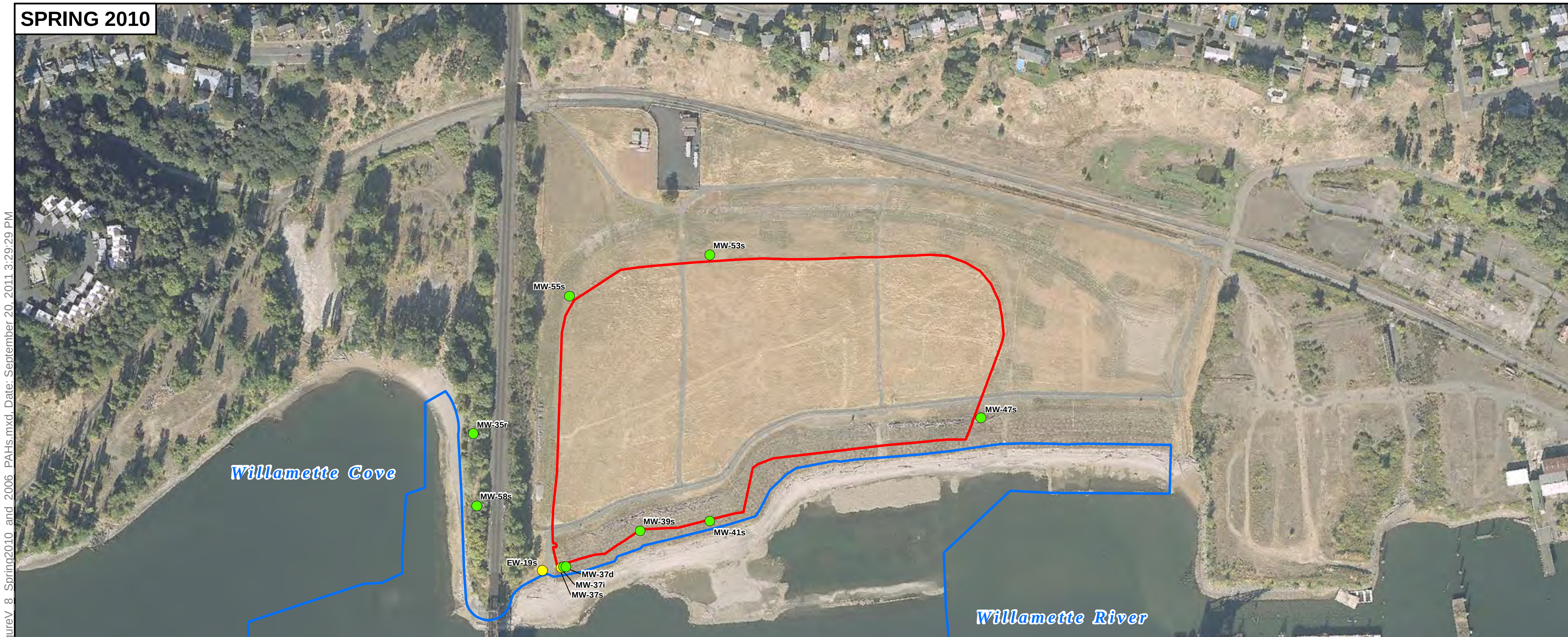
McCormick & Baxter Superfund Site
Portland, Oregon

MW-59s Groundwater Quality Data

5/11

Figure

V-7



LEGEND

Total PAHs

- Non-detect
- <50 ug/L
- >50 - 1,000 ug/L
- >1,000 - 5,000 ug/L
- >5,000 ug/L

Site Features

- Subsurface Barrier Wall
- Sediment Cap Boundary

NOTES:
1) Aerial photo taken on September 22, 2006
2) Willamette River low tide at 09:00 at 9.35 feet NAVD 88

0 350 700
Scale in feet

McCormick & Baxter Superfund Site
Portland, Oregon

Total PAHs in Groundwater
Spring 2010 and Spring 2006

9/11

HARTCROWSER GSI Water Solutions, Inc.

Figure
V-8

File Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project GIS\Project mxds\2011 Five Year Review\FigureV_8_Spring2010_and_2006_PAHs.mxd, Date: September 20, 2011 3:29:29 PM

LEGEND

Total Benzo(a)pyrene

- Non-detect
- <0.2 ug/L
- >0.2 - 2.0 ug/L
- >2.0 - 20 ug/L
- >20 ug/L

Site Features

- Subsurface Barrier Wall
- Sediment Cap Boundary

NOTES:
1) Aerial photo taken on September 22, 2006
2) Willamette River low tide at 09:00 at 9.35 feet NAVD 88

0 350 700
Scale in feet

McCormick & Baxter Superfund Site
Portland, Oregon

Total Benzo(a)pyrene in Groundwater Spring 2010 and Spring 2006

9/11

HARTCROWSER GSI Water Solutions, Inc.

Figure
V-9

LEGEND

Total Pentachlorophenol

- Non-detect
- <10 ug/L
- >10 - 100 ug/L
- >100 - 1,000 ug/L
- >1,000 ug/L

Site Features

- Subsurface Barrier Wall
- Sediment Cap Boundary

NOTES:
1) Aerial photo taken on September 22, 2006
2) Willamette River low tide at 09:00 at 9.35 feet NAVD 88

0 350 700
Scale in feet

McCormick & Baxter Superfund Site
Portland, Oregon

Total Pentachlorophenol in Groundwater Spring 2010 and Spring 2006

9/11

HARTCROWSER GSI Water Solutions, Inc.

Figure
V-10

LEGEND

- Spring 2010 Sample Locations

Site Features

- Subsurface Barrier Wall
- Sediment Cap Boundary
- Granular Organophilic Clay
- Organoclay™ Reactive Core Mats (Double)
- Organoclay™ Reactive Core Mats (Single)
- Thickened Sand Layer
- Boulder Clusters
- Willamette River Level During Sampling Event (8.0 feet)

NOTES:
1) All elevations shown in NAVD88
2) Aerial photo taken on September 22, 2006
3) Average low tide during sampling period (April 7, 2010 to April 13, 2010) was 8.0 feet NAVD88

0 250 500
Scale in feet

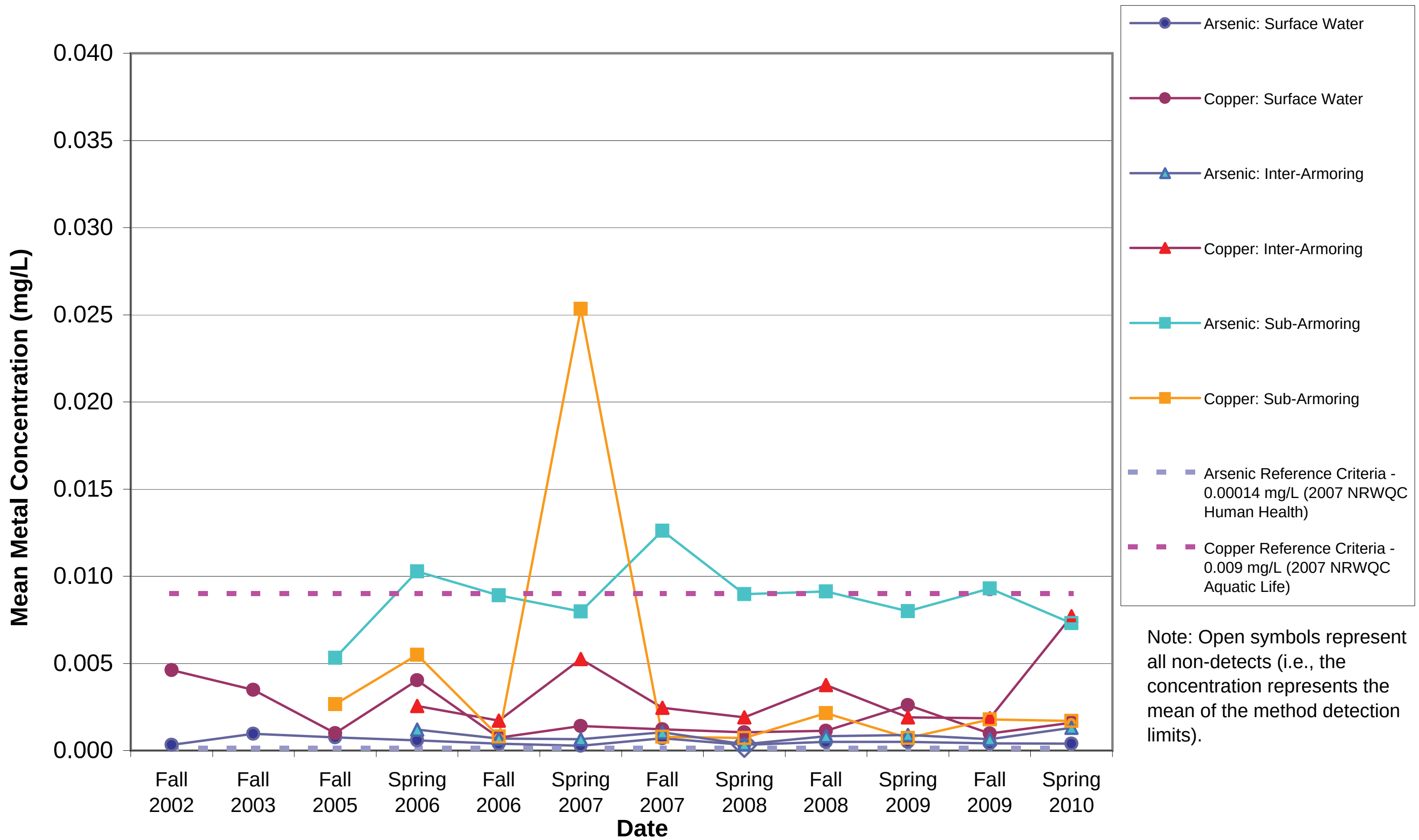
McCormick & Baxter Superfund Site
Portland, Oregon

Sample Location Map
Spring 2010

9/11

HARTCROWSER
GSI Water Solutions, Inc.

Figure
V-11



Note: Open symbols represent all non-detects (i.e., the concentration represents the mean of the method detection limits).

McCormick & Baxter Superfund Site
Portland, Oregon

Mean Concentrations for Total Arsenic and Total Copper in Surface, Inter-Armoring, and Sub-Armoring Samples

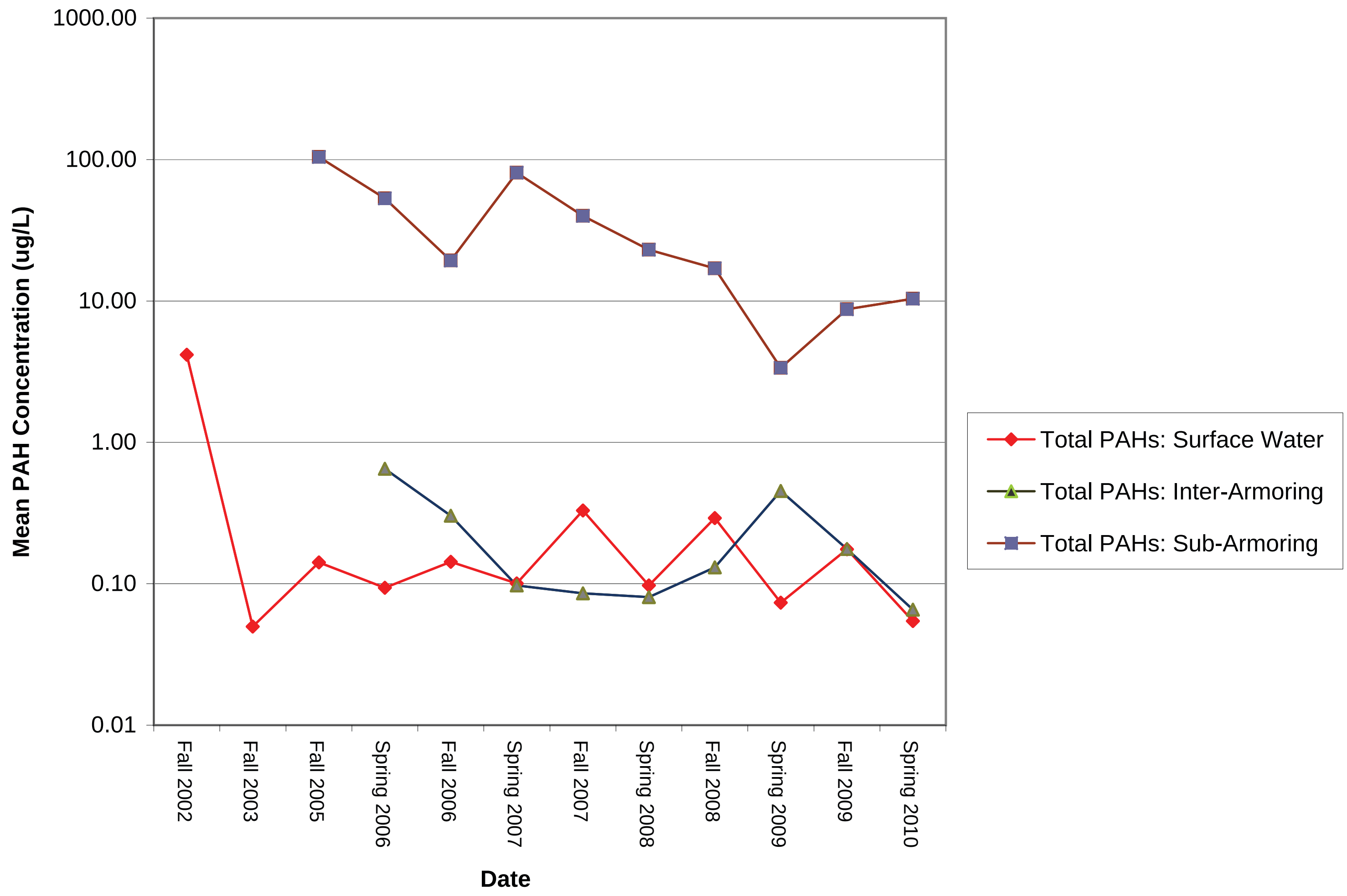
5/11

HARTCROWSER

GSI Water Solutions, Inc.

Figure

V-12



McCormick & Baxter Superfund Site
Portland, Oregon

Mean Concentrations for Total PAHs in Surface, Inter-Armoring, and Sub-Armoring Water Samples (Log Scale)

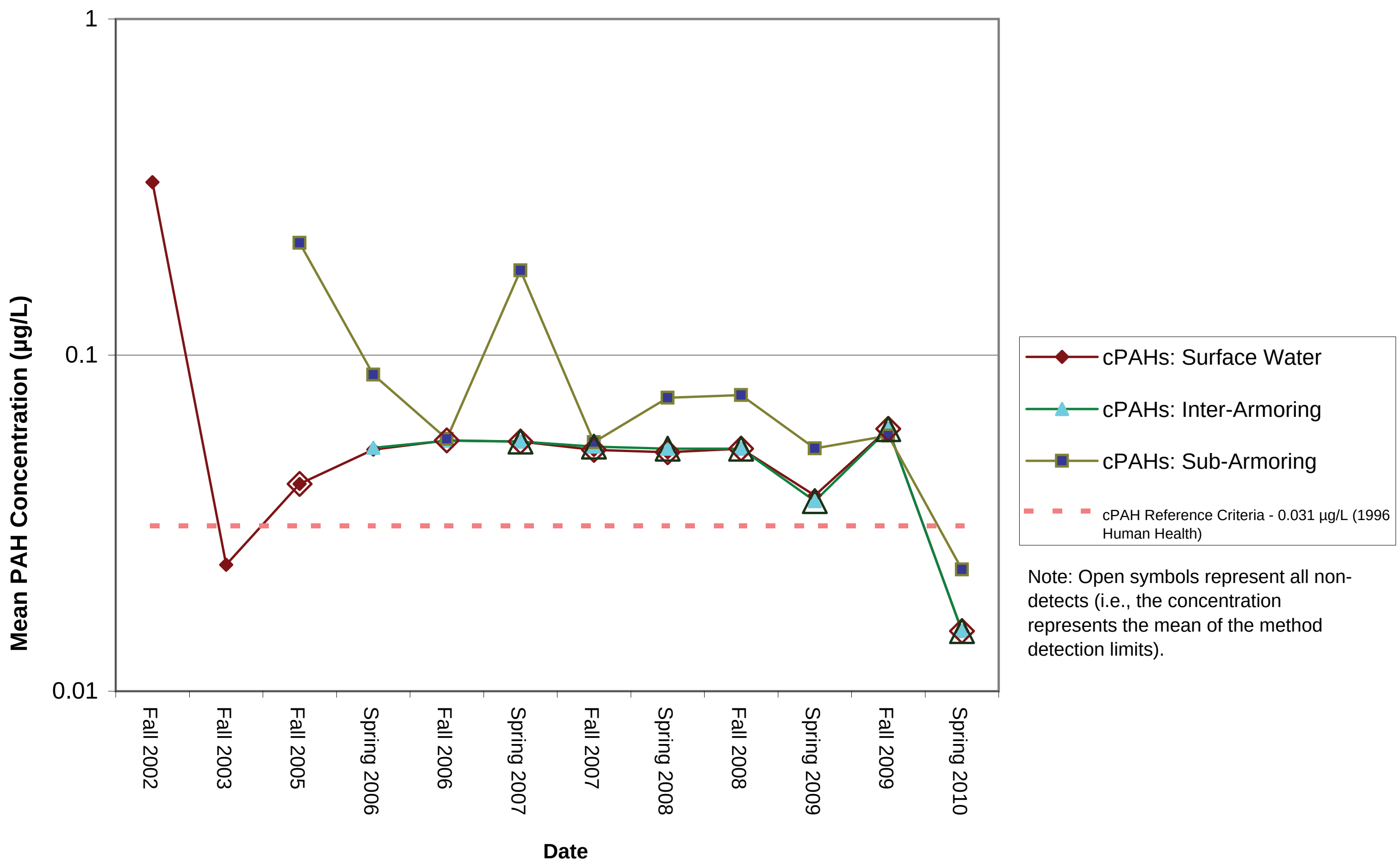
5/11

HARTCROWSER

GSI Water Solutions, Inc.

Figure

V-13



Note: Open symbols represent all non-detects (i.e., the concentration represents the mean of the method detection limits).

McCormick & Baxter Superfund Site
Portland, Oregon

Mean Concentrations for Total cPAHs in Surface, Inter-Armoring, and Sub-Armoring Water Samples (Log Scale)

5/11

HARTCROWSER

GSI Water Solutions, Inc.

Figure

V-14

LEGEND

Fall 2010 Sample Locations

Site Features

- Subsurface Barrier Wall
- Sediment Cap Boundary
- Granular Organophilic Clay
- Organoclay™ Reactive Core Mats (Double)
- Organoclay™ Reactive Core Mats (Single)
- Thickened Sand Layer
- Boulder Clusters
- Willamette River Level During Sampling Event (6.00 feet)

NOTES:

1) All elevations shown in NAVD88
2) Aerial photo taken on September 22, 2006
3) Average low tide during sampling period (October 11, 2010 to October 13, 2010) was 6.00 feet NAVD88

0 250 500

Scale in feet

McCormick & Baxter Superfund Site
Portland, Oregon

Sample Location Map
Fall 2010

9/11

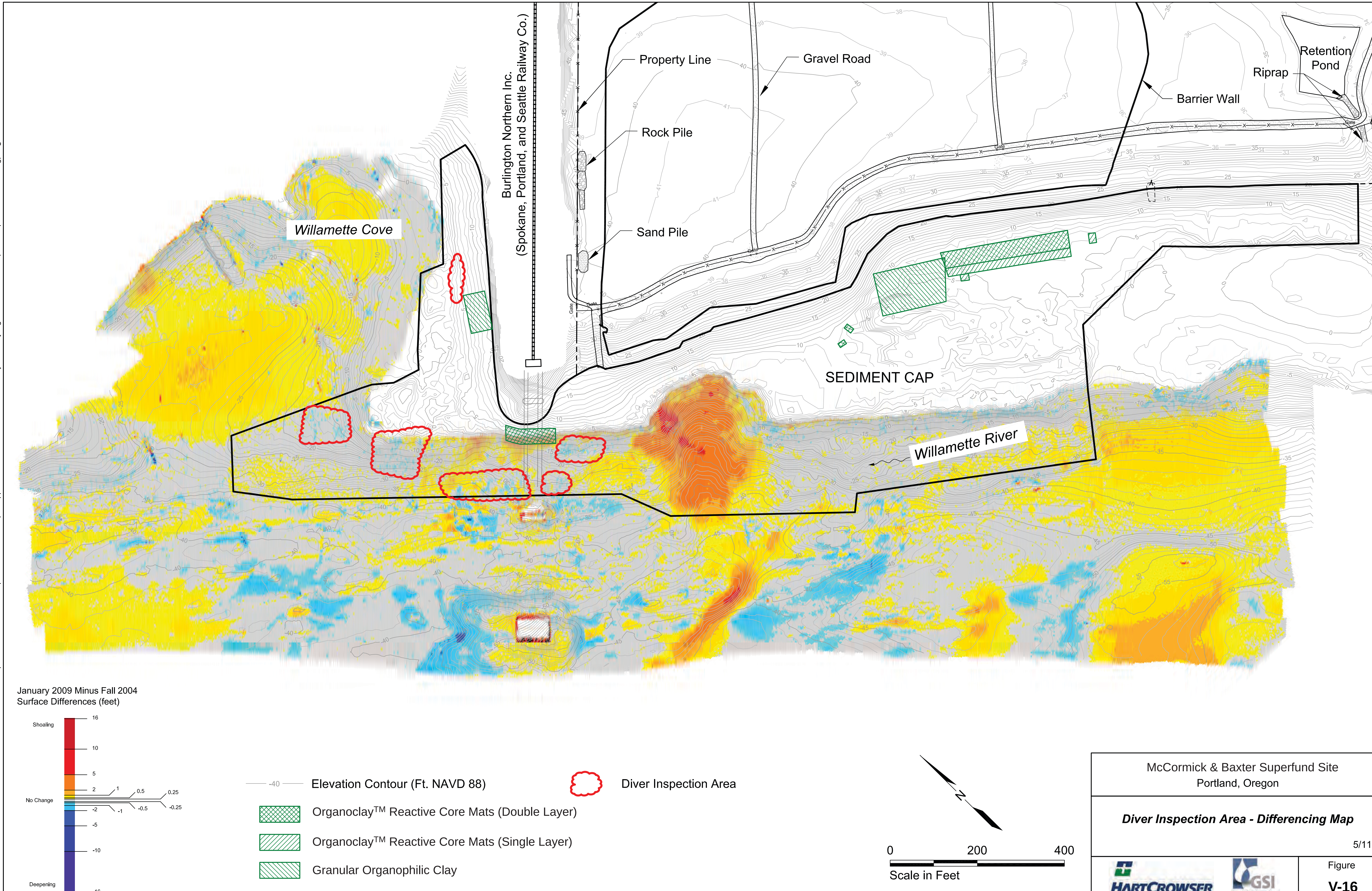
HARTCROWSER

GSI Water Solutions, Inc.

Figure

V-15

File Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project GIS\Project_mxds\2011_Five_Year_Review\FigureV_15_Fall2010_Sample_Location_Map.mxd, Date: September 21, 2011 9:21:29 AM



McCormick & Baxter Superfund Site
Portland, Oregon

Diver Inspection Area - Differencing Map

5/11

HARTCROWSER GSI Water Solutions, Inc.

Figure
V-16

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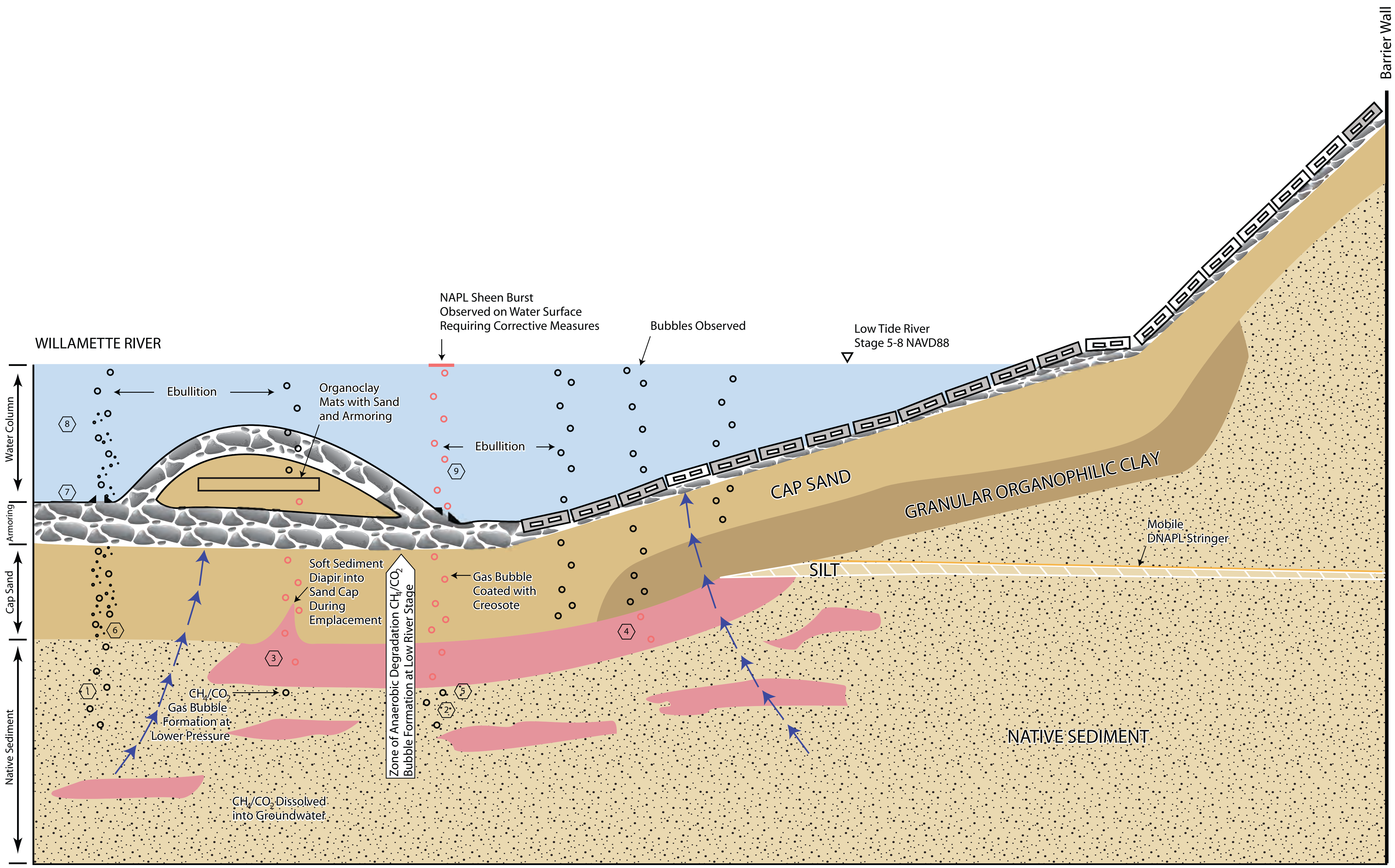


LEGEND

- Articulated Concrete Block Armoring
- Rock Armoring
- Groundwater Advection
- Cap Sand
- Granular Organophilic Clay
- Silt
- Sand
- Residual Creosote

1. CH_4/CO_2 Gas Rises to Surface without Encountering Creosote
2. CH_4/CO_2 Gas Formation in or Below Areas of Residual Creosote Rising to Surface and Producing Sheen Burst
3. CH_4/CO_2 Gas Formation in or Below Areas of Residual Creosote Passing into Organoclay Mat which Sorbs the Creosote from the Gas Bubble
4. CH_4/CO_2 Gas Formation in or Below Areas of Residual Creosote Passing into Granular Organoclay which Sorbs the Creosote from the Gas Bubble
5. Partitioning of Contaminent from Porewater into Gas Bubble (Reversible)
6. Particulate Matter Migrating Through Ebullition Pathway Driven by Gas Bubbles
7. Larger Particles Settle onto Sediment Cap
8. Smaller Particles Suspended in Surface Water
9. Contaminents Partioning from Gas Bubble into Surface Water and Visa Verse Depending on Concentration in Gas Versus Surface Water

NOT TO SCALE

McCormick & Baxter Superfund Site
Portland, Oregon

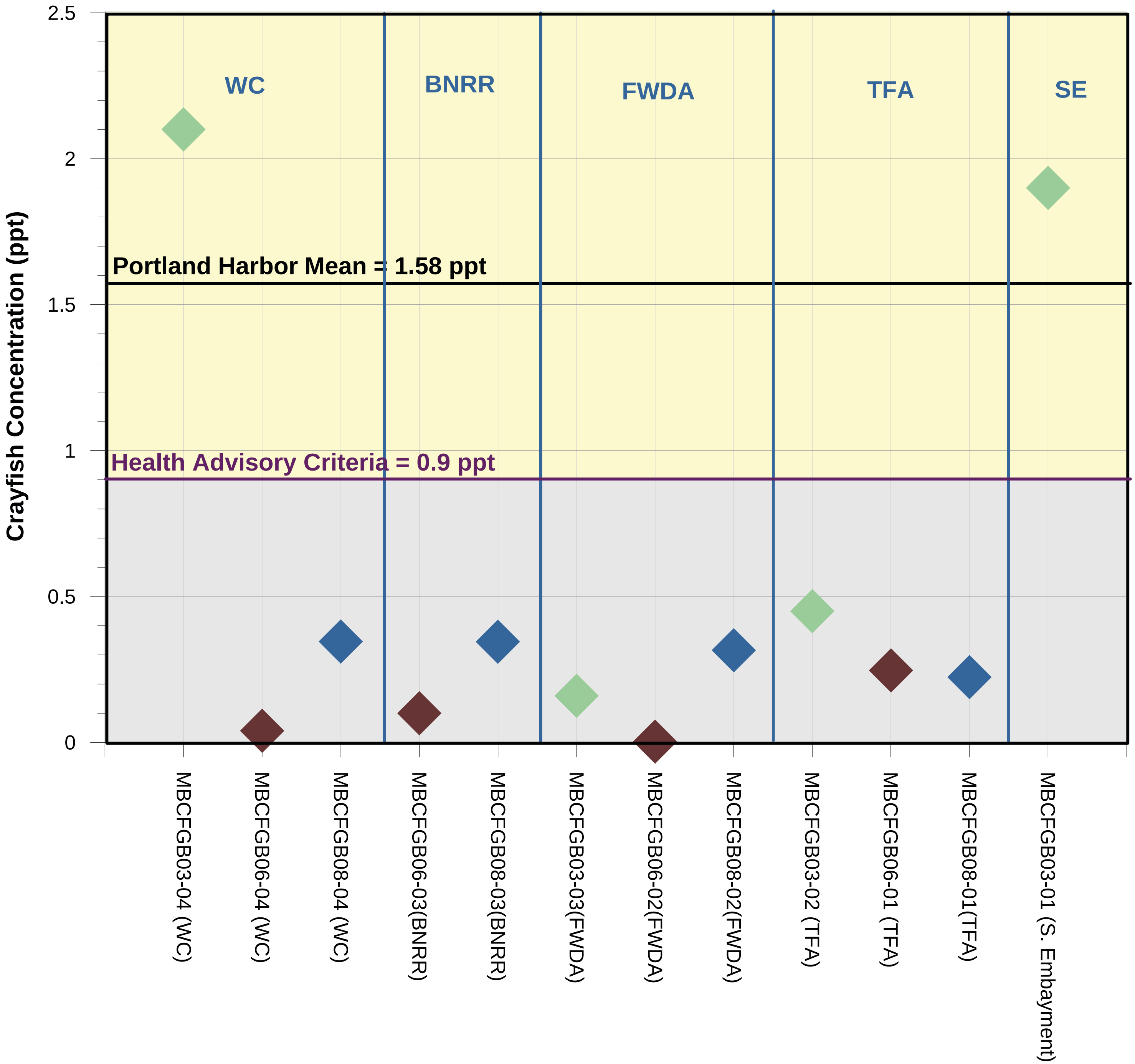
Conceptual Model of Contaminant Transpart via Gas Ebullition and Ebullition-Induced Sheen

5/09

HARTCROWSER GSI Water Solutions, Inc.

Figure
V-17

Figure V-18:
2,3,7,8-TCDD TEQ Concentration
in Crayfish Tissue
McCormick & Baxter Superfund Site
Portland, OR



Date Modified: February 2009

HARTCROWSER
GSI Water Solutions, Inc.

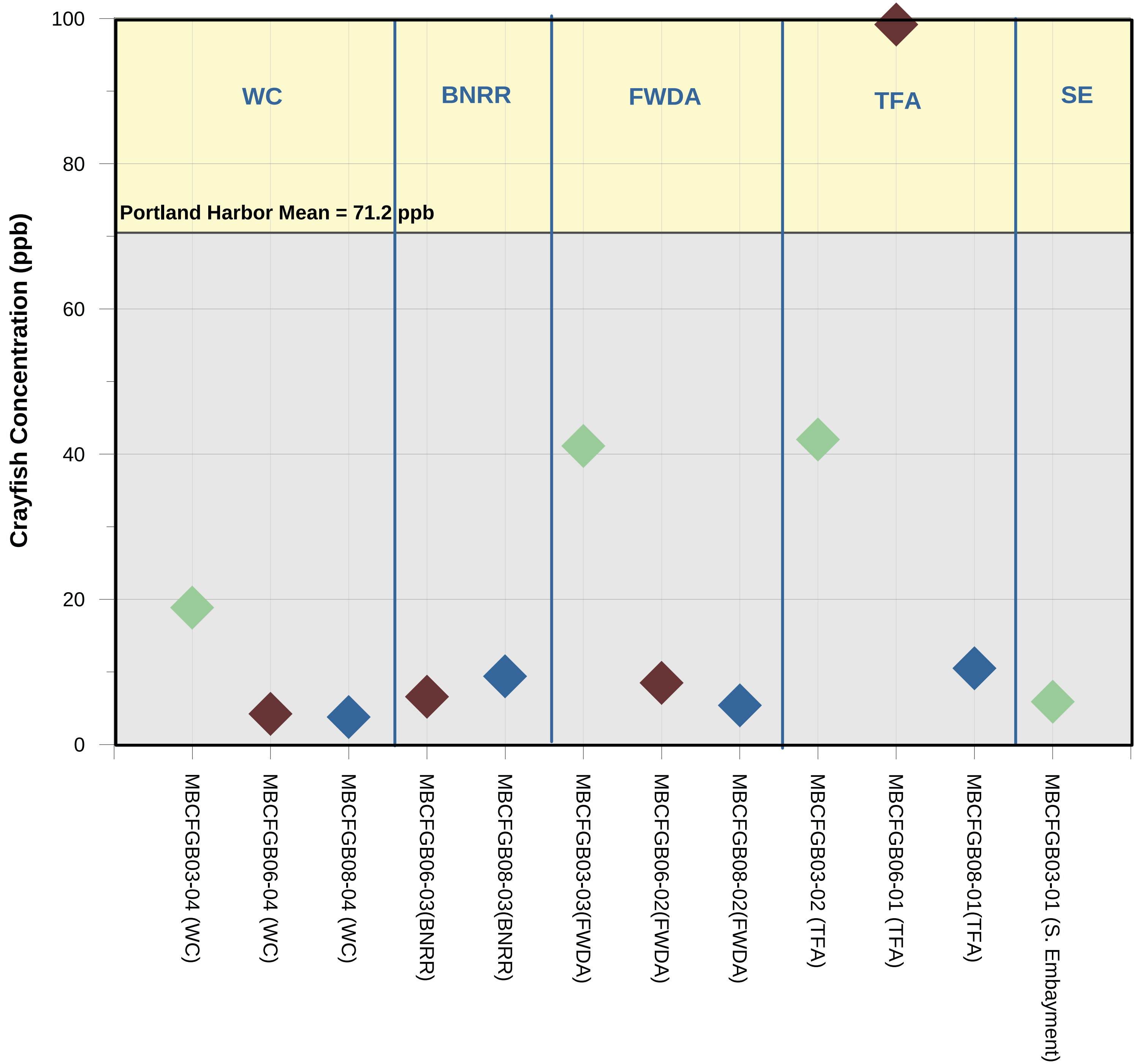


Figure V-19:
Total PAH Concentration
in Crayfish Tissue
McCormick & Baxter Superfund Site
Portland, OR

Date Modified: February 2009

HARTCROWSER
GSI Water Solutions, Inc.

ATTACHMENT 1

DOCKET NO. USCG-2008-0121: ''MCCORMICK & BAXTER'' REGULATED NAVIGATION AREA, WILLAMETTE RIVER, PORTLAND, OR

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wake speed or at the minimum speed necessary to maintain steerage.

Dated: December 2, 2008.

J.P. Currier,

Rear Admiral, U.S. Coast Guard, Commander, Thirteenth Coast Guard District.

[FR Doc. E9–2310 Filed 2–3–09; 8:45 am]

BILLING CODE 4910–15–P

DEPARTMENT OF HOMELAND SECURITY

Coast Guard

33 CFR Part 165

[Docket No. USCG–2008–0121]

RIN 1625–AA11

''McCormick & Baxter'' Regulated Navigation Area, Willamette River, Portland, OR

AGENCY: Coast Guard, DHS.

ACTION: Final rule.

SUMMARY: The Coast Guard is establishing a Regulated Navigation Area on the Willamette River, Portland, Oregon. This action is necessary to preserve the integrity of the engineered pilot cap placed over contaminated sediments as part of an Environmental Protection Agency (EPA) Superfund cleanup action at the McCormick & Baxter Creosoting Company Superfund Site. This rule is needed to prohibit activities that would cause disturbance of pilot cap material, which was placed to isolate and contain underlying contaminated sediment.

DATES: This rule is effective March 6, 2009.

ADDRESSES: Comments and material received from the public, as well as documents mentioned in this preamble as being available in the docket, are part of docket USCG–2008–0121 and are available online by going to *http://www.regulations.gov,* selecting the Advanced Docket Search option on the right side of the screen, inserting USCG–2008–0121 in the Docket ID box, pressing Enter, and then clicking on the item in the Docket ID column. This material is also available for inspection or copying at two locations: The Docket Management Facility (M–30), U.S. Department of Transportation, West Building Ground Floor, Room W12–140, 1200 New Jersey Avenue, SE., Washington, DC 20590, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays and U.S. Coast Guard Sector Portland, 6767 North Basin Ave., Portland, OR 97217, between 8 a.m. and 2 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: If you have questions on this rule, call MST1 Jaime Sayers, U.S. Coast Guard Sector Portland, Waterways Management Branch, telephone 503–240–9300. If you have questions on viewing the docket, call Renee V. Wright, Program Manager, Docket Operations, telephone 202–366–9826.

SUPPLEMENTARY INFORMATION:

Regulatory Information

On June 3, 2008, we published a notice of proposed rulemaking (NPRM) entitled ''McCormick and Baxter Regulated Navigation Area, Willamette River, Portland, OR'' in the **Federal Register** (73 FR 31652). We received no letters commenting on the proposed rule. No public meeting was requested, and none was held.

Background and Purpose

The McCormick & Baxter Creosoting Company operated between 1944 and 1991, treating wood products with creosote, pentachlorophenol and inorganic (arsenic, copper, chromium, and zinc) preservative solutions. Historically, process wastewaters were discharged directly to the Willamette River, and other process wastes were dumped in several areas of the Site. Significant concentrations of wood-treating chemicals have been found in soil and groundwater at the site and in river sediments adjacent to the Site. The EPA listed the Site on the National Priorities List (NPL) in June 1994 based on information collected by DEQ between September 1990 and September 1992. The EPA also designated the DEQ as the lead agency for implementing the selected remedy while funding for remedial design and construction was primarily provided by EPA. The DEQ implemented a number of interim removal measures between 1992 and 1994, including plant demolition, sludge and soil removals, and extraction of creosote from the groundwater aquifers. The Record of Decision (ROD) was issued by WPA and DEQ in April 1996 after considering public comments on the Proposed Cleanup Plan. The remedy addressed contaminated ground water, soil and sediment. A component of the groundwater remedy, initiated in 1994, consisted of an automated creosote extraction and groundwater treatment system. However, due to poor product recovery and high operating costs, the automated system was discontinued in late 2000. Creosote is currently being recovered by passive and manual methods. Approximately 6,200 gallons have been recovered since 1991. A contingency groundwater remedy was implemented in the summer of 2003, with the construction of a combination steel sheet pile and soil Bentonite slurry wall surrounding 18 acres. The purpose of the barrier wall is to prevent migration of creosote to the Willamette River. Implementation of the soil remedy began in March 1999 with the removal of 33,000 tons of highly contaminated soil and debris. The soil remedy was completed in September 2005 following installation of a combination impermeable/earthen cap—the impermeable portion covering the area within the subsurface barrier wall. The sediment remedy was implemented in 2004 and primarily consisted of an armored sand cap placed over 23 acres of contaminated sediment. Construction occurred during the summers of 2004 and 2005. Sediment cap construction performed in 2005 followed construction work performed by the City of Portland to stabilize two high pressure sewer lines located within a one-acre portion of the sediment cap. In addition to the sand layer, an oil adsorptive material known as organophyllic clay was used in two creosote seep areas. To protect the cap from erosion, the sand and organophyllic clay were armored with a combination of rock and articulated concrete blocks. Erosion forces evaluated in designing the cap armoring layer included hydraulic-induced stresses due to river currents associated with a 500-year flood, vessel-induced propeller velocities from a tractor tug and various sized recreational boats, wind waves associated with a 100-year wind storm and vessel wakes associated with various boats including a 100-ft fireboat traveling at 14 knots. These forces were evaluated for river level variations due to tidal action and flood currents. Additionally, numerical modeling was used to analyze wave transformation and capping of the riverbank with two feet of topsoil, turf reinforcement matting and herbaceous vegetation. Revegitation of the capped riverbank with native trees and shrubs took place in February 2006 after the soil had been stabilized with the native grasses planted in November 2004. The DEQ has requested the issuance of this RNA in order to prohibit activities that may damage the engineered sediment cap at the Site. Although the sediment cap is designed to withstand a variety of anticipated erosional forces, the cap is susceptible to damage, such as from propeller wash, deployment of barge spuds, deployment and dragging of anchors, and grounding of large vessels. If the engineered sediment cap were to be damaged by marine activities, the contaminated sediments which underlie the cap could be released to the river thereby posing an unacceptable threat to public health and the environment.

Discussion of Comments and Changes

No comments were received on this rule during the comment period such that no changes have been made to the rule.

Regulatory Analyses

We developed this rule after considering numerous statutes and executive orders related to rulemaking. Below we summarize our analyses based on 13 of these statutes or executive orders.

Regulatory Planning and Review

This rule is not a significant regulatory action under section 3(f) of Executive Order 12866, Regulatory Planning and Review, and does not require an assessment of potential costs and benefits under section 6(a)(3) of that Order. The Office of Management and Budget has not reviewed it under that Order.

We expect the economic impact of this rule to be so minimal that a full Regulatory Evaluation is unnecessary. The effect of this regulation will not be significant based on the fact there will be minimal if any effect on the navigable waterway around the regulated area due to the regulated navigation area's proximity to the shore. The local maritime community will be informed of the regulated navigation area via marine informational Notice to Mariners.

Small Entities

Under the Regulatory Flexibility Act (5 U.S.C. 601–612), we have considered whether this rule would have a significant economic impact on a substantial number of small entities. The term ''small entities'' comprises small businesses, not-for-profit organizations that are independently owned and operated and are not dominant in their fields, and governmental jurisdictions with populations of less than 50,000.

The Coast Guard certifies under 5 U.S.C. 605(b) that this rule will not have a significant economic impact on a substantial number of small entities.

The Coast Guard certifies under 5 U.S.C. 605(b) that this rule will not have a significant economic impact on a substantial number of small entities. This rule will affect the following entities, some of which may be small entities: The owners or operators of vessels intending to transit or anchor in a portion of the Willamette River. This rule will not have a significant economic impact on a substantial number of small entities because the regulated navigation area is limited in size leaving ample room for vessels to navigate around the area. Vessels engaged in commerce with the existing refueling pipeline located within the site should not be affected by this regulation in those activities but are advised to minimize potential impacts such as anchoring, wake scouring, and dragging in the vicinity of the pilot cap.

Assistance for Small Entities

Under section 213(a) of the Small Business Regulatory Enforcement Fairness Act of 1996 (Pub. L. 104–121), in the NPRM we offered to assist small entities in understanding the rule so that they could better evaluate its effects on them and participate in the rulemaking process.

Small businesses may send comments on the actions of Federal employees who enforce, or otherwise determine compliance with, Federal regulations to the Small Business and Agriculture Regulatory Enforcement Ombudsman and the Regional Small Business Regulatory Fairness Boards. The Ombudsman evaluates these actions annually and rates each agency's responsiveness to small business. If you wish to comment on actions by employees of the Coast Guard, call 1–888–REG–FAIR (1–888–734–3247). The Coast Guard will not retaliate against small entities that question or complain about this rule or any policy or action of the Coast Guard.

Collection of Information

This rule calls for no new collection of information under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501–3520).

Federalism

A rule has implications for federalism under Executive Order 13132, Federalism, if it has a substantial direct effect on State or local governments and would either preempt State law or impose a substantial direct cost of compliance on them. We have analyzed this rule under that Order and have determined that it does not have implications for federalism.

Unfunded Mandates Reform Act

The Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1531–1538) requires Federal agencies to assess the effects of their discretionary regulatory actions. In particular, the Act addresses actions that may result in the expenditure by a State, local, or tribal government, in the aggregate, or by the private sector of $100,000,000 or more in any one year. Though this rule will not result in such an expenditure, we do discuss the effects of this rule elsewhere in this preamble.

Taking of Private Property

This rule will not effect a taking of private property or otherwise have taking implications under Executive Order 12630, Governmental Actions and Interference with Constitutionally Protected Property Rights.

Civil Justice Reform

This rule meets applicable standards in sections 3(a) and 3(b)(2) of Executive Order 12988, Civil Justice Reform, to minimize litigation, eliminate ambiguity, and reduce burden.

Protection of Children

We have analyzed this rule under Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. This rule is not an economically significant rule and does not create an environmental risk to health or risk to safety that may disproportionately affect children.

Indian Tribal Governments

This rule does not have tribal implications under Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, because it does not have a substantial direct effect on one or more Indian tribes, on the relationship between the Federal Government and Indian tribes, or on the distribution of power and responsibilities between the Federal Government and Indian tribes.

Energy Effects

We have analyzed this rule under Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use. We have determined that it is not a ''significant energy action'' under that order because it is not a ''significant regulatory action'' under Executive Order 12866 and is not likely to have a significant adverse effect on the supply, distribution, or use of energy. The Administrator of the Office of Information and Regulatory Affairs has not designated it as a significant energy action. Therefore, it does not require a Statement of Energy Effects under Executive Order 13211.

Technical Standards

The National Technology Transfer and Advancement Act (NTTAA) (15 U.S.C. 272 note) directs agencies to use voluntary consensus standards in their regulatory activities unless the agency provides Congress, through the Office of

Management and Budget, with an explanation of why using these standards would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.* , specifications of materials, performance, design, or operation; test methods; sampling procedures; and related management systems practices) that are developed or adopted by voluntary consensus standards bodies.

This rule does not use technical standards. Therefore, we did not consider the use of voluntary consensus standards.

Environment

We have analyzed this rule under Department of Homeland Security Management Directive 5100.1 and Commandant Instruction M16475.lD, which guide the Coast Guard in complying with the National Environmental Policy Act of 1969 (NEPA)(42 U.S.C. 4321–4370f), and have concluded under that this action is one of a category of actions which do not individually or cumulatively have a significant effect on the human environment. Therefore, this rule is categorically excluded, under section 2.B.2. Figure 2–1, paragraph (34)(g), of the Instruction and neither an environmental assessment nor an environmental impact statement is required. This rule involves the establishing, disestablishing, or changing Regulated Navigation Areas, and security or safety zones. An environmental analysis checklist and a categorical exclusion determination are available in the docket where indicated under **ADDRESSES.**

List of Subjects in 33 CFR Part 165

Harbors, Marine safety, Navigation (water), Reporting and recordkeeping requirements, Security measures, and Waterways.

■ For the reasons discussed in the preamble, the Coast Guard amends 33 CFR part 165 as follows:

PART 165—REGULATED NAVIGATION AREAS AND LIMITED ACCESS AREAS

■ 1. The authority citation for part 165 continues to read as follows:

Authority: 33 U.S.C. 1226, 1231; 46 U.S.C. Chapter 701, 3306, 3703; 50 U.S.C. 191, 195; 33 CFR 1.05–1, 6.04–1, 6.04–6, 160.5; Pub. L. 107–295, 116 Stat. 2064; Department of Homeland Security Delegation No. 0170.1.

■ 2. Add § 165.1323 to read as follows:

§ 165.1323 Regulated Navigation Area: Willamette River Portland, Oregon Captain of the Port Zone.

(a) *Location.* The following is a regulated navigation area (RNA): All waters of the Willamette River encompassed by a line commencing at 45°34′.33″ N, 122°44′17″ W to 45°34′32″ N, 122°44′18″ W thence to 45°34′35″ N, 122°44′24″ W thence to 45°34′35″ N, 122°44′27″ W thence to 45°34′35″ N, 122°44′36″ W thence to 45°34′35″ N, 122°44′37″ W thence to 45°34′38″ N, 122°44′42″ W to 45°34′39″ N, 122°44′43″ W thence to 45°34′44″ N, 122°44′51″ W thence to 45°34′45″ N, 122°44′53″ W thence to 45°34′47'' N, 122°44′51″ W thence to 45°34′45″ N, 122°44′46″ W to 45°34′45″ N, 122°44′45″ W thence to 45°34′47″ N, 122°44′43″ W thence to 45°34′46″ N, 122°44′42″ W thence to 45°34′48″ N, 122°44′40'' W thence to 45°34′48″ N, 122°44′38″ W and along the shoreline to 45°34′46″ N, 122°44′39″ W and back to the point of origin. All coordinates reference 1983 North American Datum (NAD 83).

(b) *Regulations.* (1) Anchoring, spudding, dredging, laying cable, dragging, trawling, conducting salvage operations, operating commercial vessels of any size, and operating recreational vessels greater than 30 feet in length are prohibited in the regulated area.

(2) All vessels transiting or accessing the regulated area shall do so at no wake speed or at the minimum speed necessary to maintain steerage.

Dated: *December 2, 2008.*

J.P. Currier,

Rear Admiral, U.S. Coast Guard, Commander, Thirteenth Coast Guard District.

[FR Doc. E9–2308 Filed 2–3–09; 8:45 am]

BILLING CODE 4910–15–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 6

[EPA–HQ–OECA–2009–0006; FRL–8766–2]

RIN 2020–AA48

Procedures for Implementing the National Environmental Policy Act and Assessing the Environmental Effects Abroad of EPA Actions

AGENCY: Environmental Protection Agency (EPA).

ACTION: Direct final rule.

SUMMARY: EPA is issuing a direct final rule to make corrections to its rule entitled ''Procedures for Implementing the National Environmental Policy Act and Assessing the Effects Abroad of EPA Actions,'' which was published September 19, 2007. Since the final rule became effective on October 19, 2007, EPA has received inquiries about some minor inconsistencies and ambiguities in the final rule. This action involves four minor, technical corrections to the rule to address those issues. The first correction expands the definition of ''applicants'' to include those who request EPA approvals. The second change clarifies that a categorical exclusion includes vacant land. The third change corrects the text to indicate that the number of extraordinary circumstances is ten. The last change expands Subpart C to apply to EPA approvals as well as permits and assistance grants.

DATES: This rule is effective on April 6, 2009 without further notice, unless EPA receives adverse comment by March 6, 2009. If EPA receives adverse comment, we will publish a timely withdrawal in the **Federal Register** informing the public that the rule will not take effect.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–HQ–OECA–2009–0006, by one of the following methods:

- *http://www.regulations.gov:* Follow the on-line instructions for submitting comments.
- *E-mail: Hargrove.robert@epa.gov.*
- *Fax:* 202–564–0072, Attention: Robert Hargrove.
- *Mail:* EPA–HQ–OECA–2009–0006, Environmental Protection Agency, EPA Docket Center (EPA/DC), Enforcement and Compliance Docket and Information Center, Mailcode: 2201T, 1200 Pennsylvania Ave., NW., Washington, DC 20460.
- *Hand Delivery:* Public Reading Room, Room B102, Enforcement and Compliance Docket and Information Center, EPA West Building, 1301 Constitution Avenue, NW., Washington, DC 20004. Such deliveries are only accepted during the Docket's normal hours of operation, and special arrangements should be made for deliveries of boxed information.

Instructions: Direct your comments to Docket ID No. EPA–HQ–OECA–2009–0006. EPA's policy is that all comments received will be included in the public docket without change and may be made available online at *http://www.regulations.gov,* including any personal information provided, unless the comment includes information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Do not submit information that you consider to be CBI or otherwise protected through *http://*

ATTACHMENT 2

PICTORIAL OVERVIEW

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Photograph 1 - Upland soil cap and sediment cap in former TFA area with established vegetation and wildlife. Photograph looking Northwest (December 2009)

Photograph 2 - View of plant growth on reef and sand cover on shore. Photograph taken looking East (September 2007)

Attachment 2
McCormick & Baxter Superfund Site
Portland, OR

Photograph 3 - Large woody debris accumulation on sediment cap at South end of site. Photograph looking North (September 2007).

Photograph 4 - Exposed ACB and sand cap armoring. Photograph taken looking West (October 2010).

Attachment 2
McCormick & Baxter Superfund Site
Portland, OR

Photograph 5 - Accumulated wood debris during a high river event. Photograph take facing South (December 2010).

Photograph 6 - Gap observed between ACB. Photograph taken looking South (September 2010).

Photograph 7 - Example of grouting performed at the site. Photograph taken looking North (September 2007)

Photograph 8 - Buoy placed to mark outer boundary of sediment cap. Photograph taken looking West (October 2010).

Attachment 2
McCormick & Baxter Superfund Site
Portland, OR

Photograph 9 - Sign placed at McCormick & Baxter Property perimeter.

Photograph 10 - Southeast corner fence. Example of fencing placed along McCormick & Baxter Property perimeter. Photograph looking East (November 2008).

Photograph 11 - Damaged monitoring wellhead MW_23d due to upland soil cap subsidence. Well repaired August 2008. (June 2008)

Photograph 12 - Monitoring wells MW-23d (repaired) and EW-1s in area of soil cap subsidence. Photograph looking West (July 2010).

Photograph 13 - Vegetation growth on upland soil cap. Photograph taken looking Northwest (July 2010).

Photograph 14 - Stormwater retention pond (background) and overflow feature (foreground). Photo looking Northeast (June 2008).

Photograph 15 - Soil cap stormwater discharge pipe. Photograph looking East (December 2008).

Photograph 16 - Willamette Cove ACB unconformity. Photograph taken looking Northeast (September 2009).

Photograph 17 - Inter-armoring and sub-armoring sampling using Henry Sampler from shoreline.

Photograph 18 - Sub-armoring sample collection at location #2.
Photograph looking North (September 2007).

Photograph 19 - Low-flow flux chamber sampling using a peristaltic pump. Photograph looking Northwest.

Photograph 20 - Dr. Camper/Montana State University collecting sheen samples from overlying sand at the South End of Site. As the water table drops with the tide, the sheen sticks to the sane with a metallic luster. (August 2009)

Photograph 21 - Sheen sampling on pooled water using Teflon® nets in Former Tank Farm Area #1 (TFA-1). Photograph looking South (August 2009).

Photograph 22 - Sediment sampling using four-foot-long three-inch cores. Photograph take looking East.